Registered at the G.P.O., Sydney, for Transmission by Post as a Newspaper. Published Weekly. Price 1s.

THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—14TH YEAR. SYDNEY: SATURDAY, FEBRUARY 5, 1927. No. 6.

THE MEDICAL JOURNAL OF AUSTRALIA

VOL. I.—14TH YEAR. SYDNEY: SATURDAY, FEBRUARY 5, 1927. No. 6.

Table of Contents

A CRITICAL SURVEY OF THE ANATOMY OF THE FEMALE PELVIS BASED ON SECTIONS AND DISSECTIONS OF A SERIES OF SIXTEEN FEMALE PELVES.[1]

By F. A. MAGUIRE, D.S.O., M.D., Ch.M., F.R.C.S. (England),
Honorary Assistant Gynæcological Surgeon, Royal Prince Alfred Hospital; Honorary Gynæcologist to Out-Patients, St. Vincent's Hospital, Sydney; Lecturer in Anatomy, University of Sydney.

PART I.

INTRODUCTION.

THE work which is embodied in this thesis, is the result of six years' observation and teaching in the Department of Anatomy in the University of Sydney. The material on which the work is based, has been collected in the Department at various times. The two pelves I. II. in the series were prepared under the direction of Professor J. T. Wilson, F.R.S., many years ago. Pelvis IV. was prepared by Mr. (now Dr.) T. K. Potts; and pelvis XIV. was prepared by the late Professor J. I. Hunter and Mr. (now Dr.) W. T. D. Maxwell. The sections of pelves III., V. and VI. have been prepared under the direction of the author, while the remainder have been dissected by him. It has been thought advisable to bring all the material in the Department into one collection, so that it might be used to carry out a general survey of the anatomy of the female pelvis. All the specimens have been brought together in the Wilson Museum of Anatomy and are available there for inspection and study.

Sixteen female pelves are included in the series. They have been prepared in various ways:

I. and II. are cut in horizontal serial sections.
III. is cut in sagittal serial sections.
IV. is cut in median sagittal section.
V. is cut in serial sections at right angles to the plane of the brim of the pelvis.
VI. is cut in serial sections parallel to the plane of the brim.
VII. and VIII. are dissected from the perineal aspect.
IX. is dissected from above to display the pelvic floor.
X. has been cut in median sagittal section and the two halves are dissected from the mid-plane to the pelvic walls.
XI. is dissected from the left side after removal of the soft parts of the hip, buttock and thigh and the bony pelvic wall.
XII. is dissected from the posterior aspect, after removal of the sacrum and coccyx.
XIII. is dissected from the anterior aspect after removal of the pubes.
XIV. has been cut in median sagittal section. The two halves are dissected to display the viscera, vessels and other soft parts.

[1] Being a thesis submitted for the degree of doctor of medicine, University of Sydney.

XV. is a median sagittal section.
XVI. is a dissection of the perineal region of a full-time female fœtus.

It will be seen that the interior of the pelvis has been approached from every aspect. All the structures which enter into the formation of the pelvic walls and floor, have been displayed from several angles. The pelvic viscera have been shown in like manner. It is possible, therefore, to analyse the relations existing between the pelvic parietes and the contents of the pelvis and to see how the latter are maintained and supported in their position both with regard to the pelvic walls and floor and to each other. Many things are made clear in this way. But it is necessary to study the series of preparations and to compare one with another to obtain a comprehensive grasp of the problems they present.

The specimens have all been described in detail. Each is illustrated by at least one photograph, while some have been photographed from several angles. This has been done to try to present the outstanding features to the reader. But no series of photographs can present all the points that may be made out on observing the actual specimen. It is hoped, however, that sufficient information is presented in the series of photographs to enable the reader to follow all the points that are presented for his consideration. The detailed descriptions and pictures are collected in Part IV.

Part II. is devoted to a general survey of the anatomy of the pelvis as displayed in the specimens. Some of the generally accepted descriptions of various structures are criticized and suggestions are put forward based on the facts revealed in the specimens.

Part III. is a summary of the conclusions arrived at in Part II.

Part IV. is complete in itself.

Some of the points that are brought out in the survey are repeated in the descriptions of the individual sections and dissections in Part IV. This has led to a certain amount of repetition in the two parts. But as Part IV. is intended to be complete in itself as a Museum series, it was thought advisable to leave it intact. This renders it more useful to anyone reading on the specimens in the Museum.

Throughout the work the only illustrations are photographs of actual specimens. No diagrams or schemes have been introduced. The description is based on the specimens and every point made is demonstrated on the parts and reference is made to the photograph which illustrates it. Speculation has been avoided and an attempt has been made to deal with the facts as revealed in the sections and dissections of the series.

PART II.

Survey.

The Pelvic Walls.

Bony Walls.—The description of the pelvis throughout this work is limited to the true pelvis or *pelvis minor*. The walls of the *pelvis minor* are formed by the *os coxæ* on either side and in front, and by the sacrum and coccyx posteriorly. In the anterior part of the pelvis the bodies of the pubic bones together with the *symphysis pubis* form a broad, flattened and firm support and protection for the pelvic contents. The pubes lie in an oblique plane, so that the anterior surface looks downwards and forwards, while the posterior surface is directed upwards and backwards. In the natural position of the pelvis the dorsal surface of the pubes really helps to form a part of the pelvic floor on account of this obliquity. It is not included as part of the pelvic floor in any description, for as we shall see later, the term pelvic floor is limited to the soft parts. The pubes, however, receive a certain amount of the downward thrust of the intraabdominal pressure, for the abdominal wall is attached to the upper margin of the pubes and the bones stretch downwards and backwards behind these muscle attachments.

The rami of the pubes diverge laterally and unite with the ischium to enclose the obturator foramen. A large gap is left in the antero-lateral portion of the pelvic wall by this arrangement. This gap is completed by the obturator membrane which is considered to be in the same morphological plane as the bony walls. It gives a broad area of attachment for muscles both in the pelvis and the thigh. But, being membrane, it confers a certain degree of resiliency on the pelvic wall in the antero-lateral quadrant of the pelvis. There is a gap left in the upper part of the obturator foramen—the obturator canal—through which the obturator vessels and nerves gain access to the thigh.

Lateral to the obturator foramen there is a solid mass of bone formed by portions of the ilium, ischium and pubis. It is almost quadrate in form, extending from the ilio-pectineal line above to the *tuber ischii* below and from the obturator foramen anteriorly to the greater and lesser sciatic notches posteriorly. This bony mass forms a smooth, solid wall for the pelvis laterally. It is referred to throughout this thesis as the "quadrate mass of bone." The spine of the ischium is situated below the centre of its posterior margin and subdivides this margin into the greater and lesser sciatic notches. The acetabulum is borne on the lateral surface of the quadrate mass.

Above and behind the quadrate mass of bone the ilium forms a thick and stout bar of bone which arches over the greater notch and articulates with the ala of the sacrum. The weight of the body is transmitted through this solid bar of bone from the sacro-iliac joints to the hip joints. The ilio-pectineal line runs along the border of the bone.

The bony pelvic wall is completed posteriorly by the sacrum and coccyx. The anterior surface of the sacrum is smooth and is strongly curved from above downwards with the concavity directed backwards. It is so placed that it arches over and forms a roof for the posterior part of the pelvic cavity. This con-

cavity widens and deepens the pelvic cavity. Further, as a result of the concavity of the sacrum the axis of the pelvis is a curved line. The coccyx varies in size and in the number of its segments. It also varies in its mode of articulation with the sacrum. When it projects unduly or when it is anchylosed to the sacrum it may, and often does, form an obstruction in the path of the fœtus.

The bony walls of the pelvis form a complete ring around the pelvic cavity, broken only by the pelvic joints.

The Joints of the Pelvis.

There are three joints in the wall of the pelvis. The *symphysis pubis* lies between the pubic bones in the mid-line anteriorly. It is an amphiarthrosis. The irregular surfaces of the pubic bones are lined by hyaline cartilage. Between the two plates of hyaline cartilage there is a sheet of fibro-cartilage which binds them firmly together. In the interior of this fibro-cartilage a cavity appears about the eighth to the tenth year. This cavity usually lies nearer the posterior than the anterior surface of the symphysis. It is not always present. When present it is elongated and narrow and usually contains a little pulp or viscid fluid. It is not lined by synovial membrane. The joint cavity is to be seen in Pelvis I. Sections 9 and 10, in Pelvis V. 1 and Pelvis VI. 1.

The sacro-iliac joints lie between the articular surface of the ilium and the ala of the sacrum on either side in the postero-lateral quadrants of the pelvis. They are very strong joints as they have to transmit the weight of the trunk and upper extremities to the lower extremities. They are strong from both a bony and a ligamentous aspect. The bony surfaces are rough and irregular. They are clothed with hyaline cartilage and have only a very narrow joint cavity. These joints are classified as diarthroses and they contain a small synovial cavity. The ligaments joining the bones are strong, the strongest being the posterior sacro-iliac ligament by which the sacrum is slung between the ilia.

The pelvic joints are of great practical importance in obstetrics. They form breaks in the bony ring and confer a certain degree of resiliency upon it. During pregnancy they become softened. Walcher's position which is used to gain a slight degree of enlargement of the pelvic brim in cases where the fœtal head requires more room, depends on the movements of the sacro-iliac joints. The *symphysis pubis* may be torn through during labour or the extraction of a fœtus. In such cases the tear may be through the hyaline cartilage on either side of the fibro-cartilaginous plate. Further, a more or less permanent weakness may be left in one of the sacro-iliac joints resulting in a persistent tenderness over the joint and a chronic backache. These cases are not infrequently overlooked through failure to investigate these joints.

The Ligaments.

The outline of the bony pelvic wall is irregular, particularly postero-laterally, where a great gap is formed between the quadrate mass of bone and the lateral margin of the sacrum and coccyx. This gap is bridged by two powerful ligaments which convert it into two foramina. The sacro-tuberous ligament or great sciatic ligament extends from the lateral margin of the sacrum and coccyx to the *tuber ischii*. The sacro-spinous ligament which is smaller than the former, but still strong and firm, extends from the lateral margin of the sacrum and coccyx to the spine of the ischium. These ligaments are attached to the upper two coccygeal vertebræ and the remainder of the coccyx projects below their lower border. The greater and lesser sciatic foramina are formed by these ligaments and the posterior border of the ilium and ischium where they form the quadrate mass of bone. It is through these two foramina that the pelvic muscles, blood vessels and nerves reach the buttock. The greater sciatic foramen transmits the pyriformis muscle. Above the upper margin of the pyriformis the superior gluteal artery and the superior gluteal nerve emerge. Below the lower border of the muscle the internal pudendal artery and nerve, the inferior gluteal artery and nerve, the great sciatic nerve, the posterior cutaneous nerve of the thigh, the nerve to the *obturator internus* and the nerve to the *quadratus femoris* leave the pelvis. The *obturator internus* muscle leaves the pelvis through the lesser sciatic foramen, while the internal pudendal vessels and nerve which have hooked round the spine of the ischium, re-enter the pelvis.

It is to be noted that the sacro-tuberous and sacro-spinous ligaments lie in the postero-lateral quadrants of the pelvis. They give attachment to muscles. Thus the *gluteus maximus* muscle arises from the posterior aspect of the sacro-tuberous ligament; while the *levator ani* and coccygeus muscles are attached to the pelvic surface of the sacro-spinous ligament. If one examines the pelvis with the ligaments *in situ*, one will appreciate the fact that owing to the attachment of the *levator ani* to the sacro-spinous ligament and the spine of the ischium, the internal pudendal vessels in their course around the latter structure pass from the pelvic cavity into the ischio-rectal fossa. This is shown in the dissection of Pelvis XI. Further, these ligaments with the muscles attached to them form a resilient and flexible segment in the pelvic wall. These segments lie in the postero-lateral quadrants of the pelvis and are thus in the oblique diameter of the pelvis. They lie opposite the obturator foramina which are also in the oblique diameters of the pelvis. Thus we have an arrangement by which the descending fœtal head or other presenting part of the fœtus, coming down in the oblique diameter of the pelvis strikes these softer and more resilient portions of the pelvic floor and is assisted in its rotation into the mid-line of the pelvic outlet.

There are other ligaments in the pelvic walls, but they are directly associated with the pelvic joints and assist to strengthen and support them.

The inferior fascia of the uro-genital diaphragm (or the superficial layer of the triangular ligament) is looked on by some anatomists as being in the same morphological plane as the rest of the bony and ligamentous walls of the pelvis. Thus it is considered to complete the pelvic wall anteriorly in the same way as the obturator membrane completes it antero-laterally. It is a useful concept in arriving at an understanding of the anatomy of the anterior part of the pelvic floor.

Muscles.

Two muscles on either side clothe the pelvic walls.

The *obturator internus* muscle clothes the greater portion of the anterior and lateral pelvic walls, extending from the back of the pubes to the margin of the greater sciatic notch and from the ilio-pectineal line, where it forms the superior boundary of the quadrate mass of bone, down to the margin of the *tuber ischii*. Thus it arises from the bone right round the margin of the obturator foramen with the exception of the portion forming the obturator canal, from the medial surface of the obturator membrane and from the whole of the surface of the quadrate mass of bone. All the sections and dissections in the series show the extent of origin of this muscle, particularly Pelvis X. 1 A. It forms a thick pad of muscle over the anterior and lateral parts of the pelvic wall and as its centre is supported by the obturator membrane, it confers a certain degree of elasticity on this portion of the pelvic wall. The fibres of the muscle are all directed towards the lesser sciatic foramen. There they leave the pelvis below the level of the spine of the ischium and pass into the buttock to reach their insertion into the great trochanter of the femur.

The pyriformis muscle arises from the anterior surfaces of the lateral mass of the middle three pieces of the sacrum. Its fibres pass directly outwards through the greater sciatic foramen and run in a straight line to their insertion into the upper part of the greater trochanter of the femur. The pyriformis varies in its degree of development. It does not fill the whole of the greater sciatic foramen. The branches of the hypogastric vessels and sacral nerves which pass out into the buttock are related to its pelvic surface and to its upper and lower borders. All these structures together with the pelvic connective tissue which surrounds them, fill up the greater sciatic foramen and form soft pads above the level of the sacro-tuberous and sacro-spinous ligaments in the oblique diameters of the pelvis.

The Fasciæ.

It is a general principle throughout the body that muscles are enclosed in sheets of fascia. The fascial sheets have an attachment to bone through the medium of the periosteum wherever they come into relation with it. Thus we find that the *obturator internus* and pyriformis muscles are covered with fascia on their medial surfaces. This fascia binds the muscles down in their place and is carried beyond the margins of the muscles to receive a strong attachment to the periosteum of the pelvis around the margins of the muscles. The fascia covering the *obturator internus* is attached above in the region of the ilio-pectineal line; anteriorly it is attached to the back of the pubis; whilst inferiorly it receives a firm attachment to the inferior rami of the pubis and ischium and to the *tuber ischii*. Posteriorly the fascia of the *obturator internus* is attached to the bone along the margin of the greater sciatic foramen and the spine of the ischium. Below the spine of the ischium the *obturator internus* muscle itself passes out through the lesser sciatic foramen. The fascia is continued over the muscle as it passes through the foramen. Thus above and below it is attached to the bone forming the upper and lower boundaries of the lesser sciatic foramen, while posteriorly it passes on to the pelvic surface of the lesser sciatic ligament.

The internal pudendal vessels and nerves run along the medial surface of the lower portion of the *obturator internus* muscle. They lie in a strong fascial compartment which is called Alcock's canal, and is usually described as being due to a splitting of the layers of the obturator fascia. Elliot Smith has pointed out that this fascial compartment is simply a condensation of the connective tissue sheaths of the internal pudendal vessels and nerves. It overlies and is fused with the fascia of the *obturator internus*. He has called it the *fascia lunata*. It extends from below the spine of the ischium where the internal pudendal vessels re-enter the pelvis to the base of the uro-genital diaphragm. The *fascia lunata* forms a portion of the lateral wall of the ischio-rectal fossa. It can be seen clearly displayed in Pelves VII. and VIII. It is also shown in coronal section in Pelvis V. 3.

The pelvic surface of the pyriformis is also covered with fascia. This fascia is attached to the anterior surface of the sacrum medially and it covers over the origins of the sacral nerve trunks, because it is attached around the margins of the anterior sacral foramina. The nerves, therefore, lie outside the pelvic fascia and pass out through the greater sciatic foramen into the buttock lying behind or deep to the pelvic fascia. The fascia of the pyriformis receives attachment below the muscle to the sacro-tuberous and sacro-spinous ligaments and above it the fascia is attached to the ilium. Sheets of fascia are carried from the pyriformis fascia forwards to the fascia of the *obturator internus*. They can be seen in Pelvis I. 6 and 7 and in Pelvis II. 5. The hypogastric vessels lie on the medial surface of these sheets of pelvic fascia and they must pierce the fascia to reach the buttock. In Pelvis V. 4 the pelvic fascia can be seen passing up from the spine of the ischium to the upper border of the greater sciatic foramen. The pyriformis muscle and the great sciatic nerve which are passing out through the greater sciatic foramen lie outside or lateral to it while the hypogastric vessels lie medial to it.

Examination of a series of sections of the pelvis show then that the lateral pelvic wall is completely

lined by fascia. This fascia is continuous from the anterior to the posterior wall of the pelvis and from its upper to its lower margins. It covers the *obturator internus* where it is called the obturator fascia; it covers the pyriformis where it is called the pyriformis fascia; it bridges over the greater sciatic foramen and closes it so that the hypogastric vessels must pierce it to reach the buttock. This arrangement is shown in Pelvis IX. on the right side where the fascia has been left intact. On the left side of this dissection the pelvic fascia has been removed. As a result the *obturator internus* and pyriformis muscles are displayed. It will be seen that there is a large space (17), the portion of the greater sciatic foramen which lies in front of the pyriformis. This is the space through which the vessels and nerves which pass into the buttock below the pyriformis take their course. It is this space which is bridged across by the sheets of fascia which pass from the pyriformis to the *obturator internus*.

The Pelvic Floor.

Definitions.

The term "pelvic floor" has been applied by various authors to different groups of structures. On comparing the various descriptions of the structures which close the pelvic outlet in the female, one finds a considerable variation not only in the terms used, but also in the methods of grouping these structures.

Savage (1876) in the classical description of the female pelvis which he put forward and which was accepted for some time, did not use the term pelvic floor or pelvic diaphragm. He emphasized the importance of the "perineal septum." This is the structure now described as the uro-genital diaphragm or triangular ligament. He regarded it as a direct continuation of the vaginal coats or as "the vagina continued on to its osseous attachments." He regarded this perineal septum and the perineal body as the structures most concerned in the integrity of the female perineum.

Hart and Barbour (1880) in their description of the female pelvis included all the soft parts which fill in the outlet of the bony pelvis, and refer to them as the "pelvic floor or pelvic diaphragm." Thus they say:

> The pelvic floor is a thick fleshy elastic layer, dovetailed all round to the bony pelvic outlet. It may be considered as an irregularly edged segment of a hollow sphere, with an outer skin aspect and inner peritoneal one. On the outer skin aspect lie the external genitals. On the inner peritoneal surface we have the organ known as the uterus and its appendages, the Fallopian tubes and ovaries. The vagina runs in the erect female at an angle of about 60° to the horizon from the vaginal orifice upwards to the mouth of the womb as a transverse slit in the pelvic diaphragm.

Johnson Symington (1889) read a paper before the Obstetrical Society of Edinburgh, giving the results he had obtained by examining a pelvis in coronal section. He challenged Hart's description of the pelvic floor and defined its limits at a lower level. Thus the upper boundary is the pelvic fascia. The lower parts of the urethra and vagina are embedded in it, as is also the anal canal. But the upper part of the urethra and vagina as well as the bladder and uterus rest upon its upper surface.

J. Clarence Webster (1892) again took up the definition of the pelvic floor in a study of twenty-one pelves by frozen section and by dissection. He included the bladder, the rectum from the tip of the coccyx, the vagina and the uterus in the pelvic floor. He said that they are slung from the side walls of the pelvis by their attachments and so should be regarded as resisting the intra-abdominal pressure and forming a part of the floor.

An examination of modern textbooks of anatomy displays a similar want of unanimity. On looking through the three representative textbooks of Cunningham, Quain and Gray the following descriptions are found.

In Cunningham's textbook (fifth edition, 1922), E. B. Jamieson states that the region called the perineum is shut off from the cavity of the pelvis by the uro-genital diaphragm and two pairs of thin muscles called the *levatores ani* and the *coccygei*.

T. B. Johnson, in the same work, writes: "The pelvic diaphragm is formed by the *levator ani* and *coccygeus* muscles, which serve to uphold the pelvic floor, and are related to the rectum and the prostate or vagina." In another place he says: "The muscles which line the walls (*obturator internus* and pyriformis) and those which form the floor of the pelvis (*levator ani* and *coccygeus*), are covered on their pelvic surfaces by a layer of fascia, thicker over the *obturator internus* than it is elsewhere."

In another place in this textbook David Waterston writes: "The floor (of the pelvic cavity) is composed of the two pairs of muscles which form the pelvic diaphragm, namely, the *levatores ani* and the *coccygei*, covered by the visceral layer of the endopelvic fascia." The uro-genital diaphragm is treated as a separate structure.

Gray (twenty-second edition, 1924) does not use the term "pelvic floor." He refers to the pelvic diaphragm consisting of the *levatores ani* and *coccygei*.

In Quain's "Anatomy" (Volume IV., Part II., eleventh edition, 1923) T. H. Bryce apparently regards all the tissues from the pelvic fascia to the surface as the pelvic floor. But he uses the term pelvic floor in more than one sense. Thus on page 213 in writing of the "Fascia on the Upper Aspect of the Pelvic Floor," he states:

> In the description given on page 205 *et seq.* of the *levatores ani* it was shown that the two muscles form an almost complete lining to the cavity of the pelvis from brim to outlet. Only the sacrum, sacro-iliac foramina and the back of the pubic bones are left uncovered. The two levator muscles meet in the median plane in the rectal part of the pelvic outlet to form the rectal diaphragm which is complete, save where it is perforated by the anal canal. Posteriorly on each side of the coccyx the pelvic floor is completed by the *coccygei* muscles, while the lateral parts of the sacrum are covered and the sacro-iliac foramina occupied by the pyriformis muscles. In

front behind the pubic symphysis the two muscles stand apart and through the gap between them passes the urethra in the male, the urethra and the vagina in the female. A mass of muscular tissue and certain fascial lamellæ associated with the uro-genital passages close this gap, fill in the angle of the pubic arch and complete the floor of the pelvic cavity in this region. When the peritoneum is stripped off the upper aspect of the pelvic floor, a thick substratum of connective tissue is exposed, covering the side walls and floor of the pelvic basin. Derived from the continuous and undifferentiated mesenchyme of the embryo, this tissue by local condensations provides connective tissue coats for the viscera, sheaths for the ducts, vessels and nerves which traverse it and epimysial lamellæ on the pelvic face of the muscles.

Thus we have a variety of definitions to choose from. There can be no doubt that, speaking in general terms, the pelvic floor consists of all the structures which close the outlet of the bony pelvis and resist the intraabdominal pressure.

But it seems that for the explanation of surgical and anatomical problems a more definite subdivision of the structures is desirable. The viscera that lie in the pelvis all contain cavities and are dilatable. They all communicate through a tube or system of tubes with other structures higher in the abdomen and they form a series of reservoirs. Thus the rectum is a reservoir for the alimentary canal; the bladder for the urinary system; and the uterus for the genital system. Each is richly supplied with blood vessels, lymphatics and nerves, which reach them by neuro-vascular bundles or leashes in the pelvic connective tissue. They all communicate with the exterior by a canal of outlet, the bladder by the urethra, the uterus by the vagina and the rectum by the anal canal. These hollow viscera are as much in need of support as the other viscera in the abdominal cavity, such as the stomach, the intestines, liver, spleen or kidneys. I would restrict the term "pelvic floor" in a surgical and anatomical sense to the structures below these viscera, that is to all the structures between the pelvic fascia and the skin. The canals of exit, urethra, vagina and anal canal, pass through the floor and have definite attachments to it. This conception gives us two clearly defined sets of structures, the pelvic viscera and the pelvic floor on which the viscera lie, or above which they are partially suspended. Thus, the pelvic floor includes the muscular pelvic diaphragm (the *levatores ani* and *coccygei*), the uro-genital diaphragm or triangular ligament, the perineal body, the ischio-rectal fossæ and the superficial structures of the vulva.

The Pelvic Diaphragm.

There are two separate sets of muscles to be found in the pelvic floor. One set, consisting of the *levatores ani* and the *coccygei*, forms the pelvic diaphragm. The other set forms the group of the perineal muscles and is closely associated with the uro-genital diaphragm. These two groups of muscles have an entirely different origin.

The *levatores ani* and *coccygei* are derived from the ventral body musculature and represent the flexors and abductors of the tail of the lower orders (Bryce). They have assumed a new rôle in man. With the reduction and fusion of the caudal vertebræ they have lost their primary function and now form a muscular diaphragm to the pelvic outlet. The *levator ani* plays the chief part in contributing to this diaphragm and to the support of the viscera, especially the rectum, necessitated by the assumption of the erect attitude and the widening of the pelvic basin.

The perineal musculature is derived in development from a subcutaneous sphincter muscle (Keith) surrounding the cloacal depression and represents the common and undivided cloacal sphincter of the lower forms in which there is a single cloacal chamber. In an embryo of the second month the cloacal sphincter is still present. With the division of the internal cloaca and the establishment of separate openings for the rectal and uro-genital divisions of the chamber, the single ring-like muscle becomes resolved into two portions, an anal and a uro-genital. The anal division becomes the external *sphincter ani* in both sexes. The uro-genital sphincter, becoming connected with the pubic arch, gives origin to the *ischio-cavernosus*, the *bulbo-cavernosus*, the superficial and deep transverse perineal muscles and the sphincter of the urethra. In the female subject the primitive arrangement is more nearly adhered to as the *bulbo-cavernosi* remain apart and surround the vaginal orifice. The common sphincter is innervated by the internal pudendal nerve. With the division of the sphincter the nerve likewise divides into two main divisions, hæmorrhoidal and perineal, from which twigs are given off to the several muscles.

The pelvic diaphragm, like the diaphragm which separates the abdomen from the thorax, is a muscular structure. The two pairs of muscles of which it is composed, the *levatores ani* and *coccygei*, are firmly attached around the walls of the pelvis. They are so arranged that they almost completely close the outlet of the pelvis, leaving only an elongated narrow opening in the mid-line in the anterior half of the pelvic floor through which the canals of exit of the pelvic viscera may pass to reach the surface of the body. This space is often referred to as the "genital hiatus" and it is a useful term to apply to this gap in the muscular pelvic diaphragm.

The *levatores ani* are two broad paired sheets of muscle which form the main portion of the muscular pelvic diaphragm. They are attached to the walls of the pelvis along a plane which passes through the back of the pubes about midway between their upper and lower borders, the spines of the ischial bones and the sides of the coccyx. This plane is a horizontal one, so that as the pelvic inlet or brim is strongly tilted at an angle of about 60° with the horizontal, it follows that the pelvic walls are much higher above the plane of attachment of the *levatores ani* in the posterior part of the pelvis than in the anterior part. This results in the posterior part of the pelvic cavity being much deeper than the anterior part.

Each *levator ani* takes origin from: (i.) The back of the pubic bone at a point about midway between the upper and lower borders and extending to within about ten to twelve millimetres of the mid-line, (ii.) the spine of the ischium and (iii.) the *arcus tendineus* or the white line of the pelvic fascia.

The white line is a thick and strong band of white fibrous tissue which stretches across the medial aspect of the pelvic wall between the bony points (i.) and (ii.). It is not a straight line. It is curved slightly in two planes, its concavity being directed downwards. The white line can be palpated easily as a sharp curved edge in examination *per vaginam,* if the fingers be half flexed and turned upwards and outwards through the anterior and lateral fornices of the vagina. The origin of the muscle and the white line or *arcus tendineus* can be seen fully displayed in Pelves IX. and X. A.

Various explanations have been offered in regard to the origin of the white line. It has been described as being due to the splitting of the fascia of the *obturator internus* with a resulting thickening of the fascia. It has also been ascribed to the fusion of the fascia of the *levator ani* with the fascia of the *obturator internus.* In some of the lower orders of mammals the muscle called the *pubo-coccygeus* which is represented in man by a portion of the *levator ani,* arises from the lateral wall of the pelvis as high up as the brim. In man this occurs rarely. But there is some variation in the level of origin of the *levator ani.* The *arcus tendineus* is for practical purposes a dense band of fascia which gives origin to many of the fibres of the *levator ani.* It is a little variable in its line and level. In some cases, as in Pelvis X. A, it is not closely in contact with the *obturator internus.*

From this linear origin the muscle fibres pass backwards, downwards and inwards with varying degrees of obliquity to their attachments. Thus the fibres arising from the back of the pubes sweep back to one side of the mid-line, running parallel with it and leaving a free medial margin which bounds the genital hiatus. This margin is from fifty to sixty millimetres in length and the margins of the two muscles are about twenty-five millimetres apart. This portion of the muscle terminates: (i.) by sweeping in towards the mid-line and meeting the fibres of the opposite muscle in the perineal body as in Pelvis VII. 2, or (ii.) by becoming closely related to the external *sphincter ani,* as in Pelves VII., VIII. and XI, or (iii.) by sweeping round behind the anal canal to meet in the mid-line and to receive strong attachment to the ano-coccygeal *raphé* and through it to the coccyx.

The fibres which arise from the medial part of the white line for five to six millimetres from its medial end, accompany the pubic fibres.

The fibres which arise from the greater part of the white line and from the spine of the ischium, take a different course. They spread out in a fan-shaped fashion. From the anterior ones they take on a gradually increasing obliquity and gain insertion into the side of the anal canal, the ano-coccygeal *raphé* and the coccyx.

An examination of the series of pelves shows there is a very marked difference in structure in the two parts of the muscle. For it can be divided into two distinct portions which differ very much in their structure. If we look at Pelvis I. sections 9 and 10, Pelvis III. sections 4 and 7, Pelvis V. 2 and 2a, Pelvis VI. 2, the portion of the muscle arising from the back of the pubis and the medial part of the white line is seen to be thick and strong. It is a band of short strong fibres, having a thickness of from five to eight millimetres in various sections. It is closely related to the genital hiatus. It forms the boundary of the genital hiatus on each side and it is seen to be directly related to the lateral sides of the base of the bladder and the urethra, to have a direct attachment to the lateral wall of the vagina, to be inserted into the perineal body and to surround the anal canal.

Further, inspection of the dissection in Pelves VII. 1, 2 and 3, VIII. 1, 2 and 3, and Pelvis XI. 1 and 2, shows that this lower and medial portion of the muscle is strong and thick and differs in texture and arrangement from the rest of the muscle. These dissections show also that this part of the muscle is continuous dorsal to or behind the anal canal with the muscle of the opposite side. It can be seen, too, particularly in these dissections, that it receives a strong attachment to the powerful ano-coccygeal *raphé* and to the coccyx. This latter part of the muscle is shown in median sagittal sections, as Pelves IV., X. and XV., where the anal canal is seen to be slung from the tip of the coccyx by a strong sheet of muscle, the *levator ani,* and the fibrous ano-coccygeal *raphé.*

Compare this part with the remainder of the muscle. In Pelvis I. 8, Pelvis II. 6, Pelvis III. 4, Pelvis V. 3 and 3a and 4, Pelvis VI. 3, the remainder of the *levator ani,* that is, the portion which arises from the lateral part of the white line and from the spine of the ischium, which is inserted into the ano-coccygeal *raphé* and which forms the roof of the posterior part of the ischio-rectal fossa, is thin. The fibres are spread out into a thin sheet two to three millimetres in thickness and in places it is almost linear in section. Inspection of Pelves VII., VIII. and XI. confirms this. The muscle fibres are spread out into a thin sheet while here and there gaps may be seen between the fibres. The dissection of Pelvis IX., where the muscle is seen from the pelvic aspect and X.A 1, confirms this.

It will be seen that the *levator ani* on each side is divisible into two quite distinct parts: (i.) a broad thick band-like part associated with the genital hiatus, and (ii.) a thin sheet of muscle fibres roofing in the ischio-rectal fossa and separating it from the pelvic cavity. The first part includes both the *pubo-rectalis* and *pubo-coccygeus* portions described by Thompson. In section and dissection they are, however, practically indistinguishable. This part of the muscle forms a strong bifurcated

muscle sling, extending from the coccyx behind to the pubes in front. It divides to encircle the anal canal and unites again in the perineal body. From the perineal body to the pubes its two limbs bound the genital hiatus and are in direct relation with the vagina and the base of the bladder. They are also closely related to the upper surface of the uro-genital diaphragm and are strongly supported by it, as will be shown in the next section. By contracting this part of the muscle the individual may: (i.) raise the whole pelvic floor in virtue of its attachments to the coccyx posteriorly and the pubes anteriorly, (ii.) draw the anal canal towards the pubes to a certain extent and (iii.) exert a sphincteric action on the vagina and lend support to the base of the bladder.

This part of the muscle is easily palpated in the living subject. If on gynæcological examination *per vaginam* one palpates the lateral vaginal wall about twenty to twenty-five millimetres up the canal, one may in a normal pelvis feel on each side a thick band about eight to twelve millimetres in thickness between which the fingers must pass to gain access to the upper part of the vagina. These bands are the medial margins of the *levatores ani*. They are thicker and more definite in the living on account of the plastic tonus of the voluntary muscle which composes them. The patient can produce contraction voluntarily in these muscle bands when they stand out still more distinctly. If one now turns the fingers towards the side wall of the pelvis, one may hook the finger tips over the upper border of the *levator ani* and trace it forward to its pubic attachment and back to the perineal body. In the normal pelvis it will be found to be attached to the back of the pubis to within fifteen millimetres of the mid-line. Thence the margin can be traced back parallel to the mid-line as far as the perineal body, where the two medial margins can be felt to come together in a gentle curve. But in the pelves of parous women who have suffered obstetrical damage, the medial margin of one or even both muscles may be felt to be diverging from the mid-line. The pubic attachment is further from the mid-line than normal and the margins at the perineum may be separated by fifteen to twenty-five millimetres. In extreme cases where the perineal body has been torn through to the rectum, the margins of the *levatores ani* are widely separated in front of the anal canal.

The remainder of the *levator ani* is the portion known as the *ilio-coccygeus*. It forms a floor for the postero-lateral parts of the pelvis and separates the pelvic cavity from the ischio-rectal fossa. It is supported by the fatty tissue of the ischio-rectal fossa (*vide* Pelves III. 3 and 4 and V. 3 and 4). It gives support to a distended rectum as in V. 3 and 4. In its posterior part this portion of the muscle overlies the sacro-spinous ligament which is in turn supported by the sacro-tuberous ligament. The latter structure gives origin to a part of the *gluteus maximus* muscle. If in an examination *per vaginam* one places the fingers over this part of the pelvic floor and asks the patient to cough, a distinct and strong upward impulse is transmitted to the fingers. This is due to the contraction of the *gluteus maximus* and the *levator ani*. In any straining movement which raises the intraabdominal pressure this part of the pelvic floor reacts in this way. The thin lateral parts of the *levatores ani* muscle thus have strong elastic support from below.

The *coccygeus* muscle is almost vestigial. It is very variable in its extent and development. Usually it is represented, as in Pelves IX. and X. A, by white fibrous tissue lying on the pelvic surface of the sacro-spinous ligament. Occasionally, however, it may contain muscle fibres which lie in the same plane as the *levator ani* and are practically continuous with its posterior border. The muscle is related to the sacro-spinous ligament.

The configuration, attachments and relations of the *levatores ani* may be studied in the following specimens:

Pelvis I. sections 8, 9 and 10—horizontal sections.
Pelvis II. section 6—horizontal section.
Pelvis III. sections 4 and 7—sagittal sections.
Pelvis V. sections 2 and 2a, 3 and 3a, 4—coronal sections.
Pelvis VI. sections 2 and 3—Horizontal section.
Pelvis VII.—dissections from below.
Pelvis VIII.—dissections from below.
Pelvis IX.—dissection from above.
Pelvis X. A—dissection from mid-line.
Pelvis XI.—dissection from left side.
Pelvis XII.—dissection from posterior aspect.
Pelvis XIII.—dissection from anterior aspect.
Pelvis XVI.—dissection from below in fœtus.

The Uro-Genital Diaphragm.

The uro-genital diaphragm or triangular ligament was described by Savage as the "perineal septum." He regarded it as a very important constituent of the pelvic floor. He described it as the bony attachment of the vagina or, as he put it, "the vagina continued on to its osseous attachments." Later writers have not given this structure so much prominence. Indeed in most modern textbooks of gynæcology and pelvic surgery little or no reference is made to it.

The uro-genital diaphragm is, however, a very definite and strong structure. An inspection of the pelves in the series will amply support this statement. It is seen in section in Pelvis III. sections 4, 5 and 6, Pelvis V. 2 and 2a, and VI. 3. It is seen dissected in Pelves VII., VIII., X., XI., XIII. and XVI. The description given here is based on these specimens.

The uro-genital diaphragm or triangular ligament in the female is a thick and dense fibrous and muscular structure. It extends from a point immediately behind and below the arcuate ligament of the pubes to the anterior margin of the *tuber ischii*, forming a strong support for the anterior part of the pelvis. The uro-genital diaphragm has a strong attachment to the medial aspect of the inferior rami of the pubis and ischium just above their lower border. If the finger be run along these rami on the bone, a distinct ridge can be felt corresponding to this line of attachment. The diaphragm

stretches across from one side of the pelvic outlet to the other. There is a small space left below the *symphysis pubis* for the dorsal vessels of the clitoris. The posterior margin of the base of the uro-genital diaphragm is irregular as it fades away somewhat into the ischio-rectal fossa, some of the fibrous tissue of this space having an attachment to it. Medially it is continuous with the walls of the urethra and vagina and it is continued directly into the perineal body. This attachment is clearly shown in Pelvis X. A 1 and 2, where the urethra and vagina have been removed except where they are attached to the pelvic wall of the uro-genital diaphragm. If the finger is passed up into the hollow seen in X. A 2, it is arrested from the pubis back to the *tuber ischii* by the firm uro-genital diaphragm. This is directly attached medially to the urethral wall, the vagina and the perineal body. By this means these three structures gain firm attachment to the ischio-pubic rami. This is seen also in Pelvis VII. and Pelvis VIII. In Pelvis XI. the bony rami were removed, leaving the periosteum on their medial surfaces in position. Inspection of the specimen shows the uro-genital diaphragm firmly attached to the periosteum laterally and to the vagina and perineal body medially. In Pelvis XI. 2 an attempt has been made to demonstrate this by everting the periosteum and thus displaying the inferior surface of the uro-genital diaphragm. Further, in Pelves VII., VIII. and XI. inspection from the posterior aspect displays the thick and strong base of the uro-genital diaphragm (*vide* Pelvis VII. 1, 2 and 3 and Pelvis VIII. 1).

In section the structure and attachments of the uro-genital diaphragm are equally definite. In Pelvis III. 4 it appears as a broad band of tissue six millimetres in thickness and forty-two millimetres long. In sections 5 and 6 of the same pelvis it is almost equally definite. In Pelvis V. 2 and 2a it is shown as a dense band attached laterally to the ischio-pubic rami and medially merging into the mass of the perineal body. In Pelvis VI. 3 the perineal body is seen to be gaining attachment to the rami of the ischium by means of the base of the uro-genital diaphragm.

This structure, then, forms a strong support for the anterior part of the pelvic floor from the pubes to the perineal body. And this corresponds to the genital hiatus between the *levatores ani*. It is thus a means of strengthening and supporting the pelvic floor at this point of weakness. Further, the *levatores ani* are intimately related to its upper surface. All the sections and dissections referred to in this and the preceding section bear this out. The medial margins of the *levatores ani* are fused with the superior surface of the uro-genital diaphragm at the point where both structures are attached to the vagina and the perineal body. There is a triangular space left between the superior surface of the uro-genital diaphragm, the inferior surface of the *levator ani* and the fascia of the *obturator internus* (*vide* Pelvis VII. 1, 2 and 3 and Pelvis VIII. 1). In Pelvis XI. an instrument may be passed into this space for thirty-two millimetres. It diminishes rapidly anteriorly and is obliterated as the structures converge behind the pubis. The base of this space is continuous with the ischio-rectal fossa.

The urethra and base of the bladder, the vagina and the perineal body thus gain strong support through the uro-genital diaphragm and *levatores ani*. But the former is a passive support, while the latter is active and muscular. This is in accordance with the general anatomical principle seen everywhere throughout the body, that where structures require continuous support, they have fibrous structures developed to support them. One never finds structures such as muscle or other tissues of a high order of development, called on for continuous action. This is left to the connective tissues, which are developed to form ligaments, sheaths or sheets of membrane with bony or fibrous attachments.

In structure the uro-genital diaphragm consists of three layers. There is a layer of fascia on either surface with a layer of muscle between. The fasciæ are known as the superficial or inferior fascia and the deep or superior fascia. The superficial or inferior fascia is strong and fibrous. It is regarded by many anatomists as being in the same morphological plane as the bony and ligamentous pelvic wall, that is as a part of the wall of the pelvis developmentally. The deep or superior fascia is really a part of the parietal pelvic fascia clothing the pelvic surface of the muscles which lie in the diaphragm.

The muscles in the uro-genital diaphragm are the deep transverse perineal muscle, which is attached to the bone on both sides and stretches across from one side to the other between the urethra and vagina and in front of the urethra and the *sphincter urethræ*. The latter is well shown in Pelvis X. A 2. By means of the diaphragm the *sphincter urethræ* has firm attachments to the bony pelvic wall and is enabled to contract effectively. Bonney has drawn attention to the necessity for this as a *point d'appui* for the action of the muscle and its relation to some cases of urinary incontinence.

The uro-genital diaphragm in the female does not lie in a horizontal plane, stretched taut between the ischio-pubic rami as it does in the male. In the male it forms a strong support for the prostate and bladder. It gives firm attachment to the bulb of the penis, and according to Elliot Smith acts as a *point d'appui* for the penis in erection. In the female its position and functions are entirely different. It may, indeed, act as a *point d'appui* for the bulb of the vestibule in the erectile function of the clitoris, but only to a small extent. It lies at an angle to the horizontal. This angle varies with the condition of the pelvic floor. In parous pelves such as VII. and VIII. of this series, it has an inclination of from 30° to 45° down from the horizontal, while in *procidentia uteri* the author has shown that it may have an angle approaching 90°

with the rami. In the fœtus, however (*vide* Pelvis XVI.), it is dependent from the rami at an angle approaching 70°. So there must be a considerable amount of "take up" or ascent of the vulva from infancy onwards for the uro-genital diaphragm to approach the horizontal or a level anywhere near the horizontal.

The functions of the uro-genital diaphragm seem to be to act as a passive support for the pelvic floor in the region of the genital hiatus; to reinforce the *levatores ani* in this region; to give firm bony attachment for the urethra, the lower part of the vagina and perineal body and through the latter the anal canal; to afford a firm surface of attachment for the bulb of the vestibule on either side of the mid-line.

The configuration and attachments of the uro-genital diaphragm may be studied in the following specimens:

Pelvis III. 4, 5 and 6—sagittal sections.
Pelvis V. 2 and 2a—coronal section.
Pelvis VI. 3—horizontal section.
Pelvis VII.—dissection from below.
Pelvis VIII.—dissection from below.
Pelvis X.—dissection from below.
Pelvis XI.—dissection from left side.
Pelvis XIII—dissection from anterior aspect.
Pelvis XVI.—dissection in fœtus.

The Perineal Body.

The perineal body in the normal pelvis is a firm mass of tissue which appears triangular in median sagittal section. It is situated between the lower part of the posterior wall of the vagina and the anal canal, its base being formed by the skin of the obstetrical perineum, that is from the anus to the vagina. In this series it is seen in section in Pelves III. 5, IV., X. A B, XIV. and XV.

In all these sections it appears as a dense, firm mass of tissue, triangular in general outline, with its apex directed upwards between the anal canal and the vaginal wall. The apex of the perineal body appears to lie opposite a point from fifteen to twenty millimetres inside the vaginal orifice about opposite the point where the *levatores ani* pass round the vagina. At this point the anal canal joins the rectum and the lumen of the bowel bends sharply backwards. The recto-vaginal septum is attached to the apex of the perineal body. The anterior edge of the perineal body varies with the amount of obstetrical damage the patient has sustained. In Pelves VII. and VIII. the perineum has been torn back to a certain extent and it is therefore somewhat shortened. In this series it varies from fifteen to thirty millimetres in length.

In Pelvis V. 2 and 2a the perineal body is cut in section about three millimetres in front of the anterior wall of the anal canal. It consists of white fibrous tissue with fibres of the external *sphincter ani* in it medially; the uro-genital diaphragm merges into it laterally and gives it strong and direct attachment to the ischio-pubic rami; the *levatores ani* are inserted into it laterally above the uro-genital diaphragm. It is a composite structure forming a central node in the pelvic floor. The *levatores ani* are joined in its upper part. Studdiford has stated that they are joined by plain muscle tissue in the upper part of the perineal body.

The Pelvic Fascia.

The muscles which line the walls of the pelvis and those that enter into the formation of the pelvic diaphragm, are clothed, as are all the muscles in the body, with fascia. Fascia consists of sheets of white fibrous connective tissue which form sheaths for muscles which bind them together and attach them to bone. In the pelvis the usual description subdivides the fascia into two sets, parietal and visceral. The parietal pelvic fascia was said to clothe the muscles which line the wall, while the visceral pelvic fascia was assigned to the muscles of the pelvic diaphragm. This form of description has given rise to endless confusion in the minds of students. It would seem simpler to confine the term visceral to fascia which is actually reflected on to or related to viscera. The pelvic diaphragm is not a viscus any more than is the respiratory diaphragm. The *obturator internus* and pyriformis muscles are covered with fascia which has already been described in detail. This may be called parietal pelvic fascia if it is desired to retain the term at all. The *levatores ani* and *coccygei* are also clothed with fascia on both their pelvic and perineal surfaces. The fascia on the pelvic surface of the *levator ani* fuses with the fascia of the *obturator internus* at the white line of the pelvic fascia. Medially it is carried in to cover the *levatores ani* as they pass towards the mid-line. At the genital hiatus it passes round the medial border of the muscle and becomes continuous with the fascia on its inferior surface. At the same time, because the structures are in contact with one another, it fuses with the superior or deep fascia of the uro-genital diaphragm. With this it is reflected on to the side walls of the urethra and bladder and the vagina, helping to form a fascial sheath for them. Here only is it visceral and the term "visceral pelvic fascia" should be confined to the reflection of the fascia of the *levatores ani* on to the viscera. The same applies to the rectum and anal canal. Elsewhere it should be spoken of as the fascia of the *levator ani*.

The inferior surface of the *levator ani* is likewise covered with fascia which may be called the inferior fascia of the *levator ani*. Where the *levator ani* arises from the fascia of the *obturator internus* on the lateral wall of the pelvis, these two fasciæ unite. But there is an extra sheet of fascia thrown across the upper part of the ischio-rectal fossa (*vide* Pelvis V. 4 and 4a). It extends from the inferior fascia of the *levator ani* to the obturator fascia and limits the upper part of the ischio-rectal fossa. This fascia was described by Elliot Smith who called it the *lamina terminalis*. It prevents the upward spread of inflammatory exudates in the ischio-rectal fossa and directs them down towards the anal canal. The small space above the *lamina terminalis* is the suprategmental space.

Structures Superficial to the Uro-Genital Diaphragm.

There is a deep space called the superficial perineal pouch on either side of the *rima pudendi*, lying between the skin of the *labium majus* and the inferior fascia of the uro-genital diaphragm. This space is bounded laterally by the ischio-pubic rami and medially by the perineum, vagina and urethra. The space is filled with loosely packed fatty and areolar tissue which is in direct continuity anteriorly with the subcutaneous tissue of the *mons pubis*. Posteriorly it is partially but incompletely shut off from the ischio-rectal fossa by the attachment of the superficial fascia to the base of the uro-genital diaphragm. The space is shown in section in Pelvis I. 11, Pelvis II. 8, Pelvis III. 4 and 5, Pelvis V. 2 and Pelvis XIII. It is also shown in the dissections of Pelvis VII. 3 and Pelvis XI. 1 and 2 and Pelvis XIII. Its medial boundary is shown in Pelvis XI. 1 and 2.

The main structures in this compartment are the crura of the clitoris and the bulb of the vestibule. The crura of the clitoris are thick and tapering. They are seen in Pelvis VII. 1, Pelvis XI. and Pelvis XIII. They are firmly bound down to the ischio-pubic rami and to the inferior fascia of the uro-genital diaphragm along their junction. Each crus extends back to the anterior part of the *tuber ischii*. It is clothed by the *ischio-cavernosus* muscle.

The bulb of the vestibule is closely applied to the lateral wall of the vagina (*vide* Pelves VII., XI. and XIII.). It tapers rapidly anteriorly and passes into the *pars intermedia* which underlies the body of the clitoris. In Pelvis I. 11 and in Pelvis II. 8 the bulbs of the vestibule and the crura of the clitoris are cut in section. The cavernous tissue in their interior is well shown, particularly in the latter specimen.

The body of the clitoris is formed at the anterior margin of the uro-genital diaphragm and the lower border of the pubis by the junction of the two crura. Pelvis XIII. shows this best, but it is also shown in Pelvis VII. and Pelvis XI. It is also seen in median sagittal section in Pelvis IV., where the vascular *pars intermedia* underlies it and in Pelvis X. B. The body of the clitoris has a length of about thirty to thirty-five millimetres in all the specimens where it is displayed in this series. It is bent down at a right angle. It is about twelve to fifteen millimetres in thickness dorso-ventrally and about six to eight millimetres in width. The glans is three to five millimetres in length.

There is no definite evidence in any section or dissection in this series of a firm sheet of superficial fascia attached throughout the length of the base of the uro-genital diaphragm as the fascia of Scarpa is in the male. The demarcation of a superficial perineal pouch is not definite as in the male.

In the fatty tissue of the space the labial branches of the internal pudendal vessels and nerves ramify. The depth of the space, from the skin to the inferior fascia of the uro-genital diaphragm, varies with the fatness of the specimen. In this series it averages from twenty-five to thirty-five millimetres.

The Ischio-Rectal Fossæ.

Each ischio-rectal fossa derives its name from a portion of its surroundings, although as a matter of fact the rectum does not come into direct relation with it.

The ischio-rectal fossæ are bilateral structures, situated one on each side of the pelvis below the pelvic diaphragm. The fossæ in the recent condition are completely filled with fatty and areolar tissue which is very soft and lobulated.

The outline of the fossa is that of an irregular wedge, with its edge directed upwards and its base downwards towards the skin. Each has a roof, a floor, medial and lateral walls and anterior and posterior ends or extremities.

The lateral wall is formed by the lateral wall of the pelvis below the origin of the *levator ani*. It consists of the inferior rami of the pubis and ischium, the *tuber ischii* and the greater sciatic ligament. The bones are clothed by the *obturator internus* muscle and it is in turn covered by its fascia. So that the obturator fascia with the *fascia lunata* (Alcock's canal) and the inferior margin of the *tuber ischii* and the greater sciatic ligament with the *gluteus maximus* muscle form its actual lateral boundaries.

Medially the wall of the fossa is formed by the inferior surface of the *levator ani* with its fascia and below this by the external sphincter ani and the ano-coccygeal *raphé* (*vide* Pelves VII. and VIII.).

These walls converge and meet above in a blunt and rounded angle. This is shown in Pelvis V. 3 and 3a. But the *lamina terminalis* of Elliot Smith forms the real roof of the space. It is to be seen in the section. The *lamina terminalis* helps to suspend the anal canal from the lateral pelvic wall in the same way that the uro-genital diaphragm fixes the vagina and perineal body. It is, however, not in any way as strong and definite a structure as the latter.

Anteriorly the ischio-rectal fossa is continuous with the space above the uro-genital diaphragm as shown in Pelves II. 7, VII., VIII. and XI. The space tapers rapidly, but is twenty-five to thirty-five millimetres in length. Below the uro-genital diaphragm the ischio-rectal fossa is incompletely shut off from the superficial perineal pouch by the attachment of the superficial fascia to the base of the uro-genital diaphragm. The two spaces appear continuous in horizontal sections such as I. 11 and II. 8.

Posteriorly the relationship existing between the sacro-tuberous and sacro-spinous ligament and the structures attached to them determines the shape of the posterior extremity of the fossa. The sacro-spinous ligament lies on the anterior or ventral surface of the sacro-tuberous ligament. The two ligaments are intimately attached to one another except in the lateral twenty-five to thirty-

five millimetres, where they separate to bound the lesser sciatic foramen. The *levator ani* is attached to the ventral surface of the sacro-spinous ligament. The *gluteus maximus* is attached to the dorsal surface of the sacro-tuberous ligament. Hence these muscles come into close contact and limit the space posteriorly. The *gluteus maximus* actually forms the posterior boundary (*vide* Pelvis III. 3, 4, 6 and 7 and Pelves VII. and VIII.). On raising the *gluteus maximus* in VII. and VIII. the space is seen to terminate in this way by the convergence of the muscles and ligaments. But there is a space left laterally between the sacro-tuberous and sacro-spinous ligaments. It can be felt as a narrow slit. Through this space the internal pudendal vessels and nerves enter and the commencement of the *fascia lunata* (Alcock's canal) is seen and felt at this point in Pelves VII. and VIII.

The configuration and boundaries of the ischio-rectal fossa may be studied in:

Pelvis I. section 11—horizontal section.
Pelvis II. sections 7 and 8—horizontal section.
Pelvis III. sections 3, 4, 6, and 7—sagittal section.
Pelvis V. sections 2 and 2a, 3 and 3a—coronal sections.
Pelvis VII.—dissection.
Pelvis VIII.—dissection.
Pelvis XI.—dissection.

The Pelvic Contents.

The Viscera.

The main structures in the pelvis are the three sets of organs:

(i.) The bladder, with its ducts, the ureters and its canal of exit, the urethra.
(ii.) The uterus, with its appendages, the uterine tubes and ovaries and its canal of exit, the vagina.
(iii.) The rectum and its canal of exit, the anal canal.

The canals of exit leave the pelvis by piercing the pelvic floor. But a portion of each is found above the pelvic floor in contact with its viscus.

(i.) The bladder occupies the anterior part of the pelvis. It rests on the pelvic floor. Its base and inferior surface are in contact with the back of the pubes, the *levatores ani* and, between the medial margins of the latter, with the upper surface of the uro-genital diaphragm. The bladder is only attached to the uro-genital diaphragm and the medial margins of the *levatores ani*. This attachment is through the true ligaments of the bladder which are described in the next section. This fixed portion forms part of the base of the bladder. The rest of the bladder is separated from the pelvic walls and floor by fatty and areolar tissue and from the back of the pubes by the cave of Retzius with its retro-pubic pad of fat. The bladder, as it fills, rises in the pelvis (*vide* Pelvis XII.) and the peritoneum is carried up with it. On comparing Pelves III. 4, IV. and XV. one finds that the peritoneum is carried on to the bladder at different levels with regard to the abdominal wall according as the bladder is completely empty and contracted, partly empty or full. Thus, when it is empty, as in Pelvis III. 4, the peritoneum descends to the pubis before passing on to the bladder. When partially filled as in Pelvis IV. or distended as in Pelvis XV. the bladder comes into direct contact with the posterior surface of the abdominal wall and the peritoneal reflection is raised to a higher level.

The ureters descend on the pelvic wall and pass forward to reach the bladder. They are dealt with in a separate section.

The urethra passes almost at once into the uro-genital diaphragm. But in its very short course in the pelvis it is associated with the base of the bladder and is firmly fixed to the upper surface of the uro-genital diaphragm.

(ii.) The uterus is a mobile organ situated above the level of the pelvic floor. It is suspended in the pelvic cavity in a manner which has been described above.

The uterus as seen in this series of specimens does not conform to the normal adult organ of child-bearing age. The specimens are from individuals long past the menopause. The uterus has undergone the usual postmenopausal shrinkage. They must not be taken therefore as typical specimens of adult child-bearing uteri. The anterior surface of the *cervix uteri* is related to the base of the bladder. The cervix is so situated that it is in a line between the back of the pubes and the coccyx and approximately opposite the spines of the ischium. Normally it lies behind the axis of the pelvis, that is nearer the sacrum than the pubes. But the uterus is subject to a considerable range of movement in the pelvis.

Thus in regard to the position of the cervix in I. 7 and 8 it is just in front of a line drawn between the ischial spines and closer to the sacrum, in II. 5 and 6 it is similarly situated but drawn over to the right of the mid-line, in III. 5 it is in the axis of the pelvis, in IV. it is in the axis of the pelvis, but the body of the uterus is retroverted to a slight degree, in X. B it is nearer the sacrum, in XII. it is drawn over to the right, in XIII. it is drawn over to the left, in XIV. A it is nearer the sacrum.

It is to be specially noted that in none of the specimens in the above list is there any sign of disease or inflammatory adhesion to cause a pathological displacement of the uterus. These variations in position may be taken (apart from the retroversion in Pelvis IV.) as being within the normal range of movement of the uterus.

The tubes and ovaries conform with the usual description, but the ovaries are shrunken and post-menopausal.

The vagina appears as a thick-walled passage from fifty to sixty-eight millimetres in length, extending from the vulva to the cervix. It can be divided into three distinct parts: (i.) The part below the uro-genital diaphragm where it is related to the labia and the bulb of the vestibule; it is twenty to twenty-five millimetres in length. (ii.) The part which

pierces the pelvic floor; it is firmly fixed by the attachment of the uro-genital diaphragm and *levatores ani* to its lateral walls; it is about fifteen millimetres in length. (iii.) The pelvic part which stretches from the pelvic floor to the uterus; it is about thirty millimetres long. The lateral relations differ in the three parts. Below the uro-genital diaphragm it is related to the *labia majora* and the bulb of the vestibule. Above these it is related to the uro-genital diaphragm and the *levatores ani*. Above the pelvic floor the lateral wall of the vagina is directly related to the pelvic connective tissue which in this region is sometimes called the paracolpos.

Anteriorly the vagina is related to the base of the bladder above, while below this the urethra forms a direct relation in the mid-line. Lateral to the urethra it is in contact with the pelvic connective tissue above the pelvic diaphragm and with the connective tissue of the superficial perineal pouch and the bulb of the vestibule below the uro-genital diaphragm.

Posteriorly the vagina is related to the perineal body for twenty-five to thirty millimetres below. This separates it from the anal canal. Above the perineal body it is related to the front wall of the rectum except in the upper ten millimetres, where it is covered by peritoneum. The recto-vaginal septum separates the vagina from the rectum.

The position of the vagina in regard to the mid-line varies. It is asymmetrically placed in several of the specimens, following the displacement of the uterus that has already been indicated. There is no reason apparent in any of the specimens for this lateral displacement. It must be regarded as being developmental in origin.

The axis of the vagina is inclined at an angle of about 60° with the horizontal. It is approximately parallel to the plane of the brim. But this depends on the state of the other viscera. Thus in Pelvis XV., where the bladder and rectum are both dilated, the axis of the vagina is vertical.

In all the specimens the vaginal walls are in contact and the lumen is only a potential space.

The structure and relations of the vagina are shown in the following specimens:

Pelvis I. sections 8, 9, 10 and 11—horizontal.
Pelvis II. sections 6, 7 and 8—horizontal.
Pelvis III. sections 5 and 6—sagittal.
Pelvis IV.—median sagittal section.
Pelvis V. 2 and 2a—coronal sections.
Pelvis VI. 5—oblique section.
Pelvis VIII.—dissection from below.
Pelvis IX.—dissection from above.
Pelvis X. A—dissection from mid-line.
Pelvis X. B—dissection from mid-line and in front.
Pelvis XI.—dissection from left side.
Pelvis XII.—dissection from posterior aspect.
Pelvis XIII.—dissection from anterior aspect showing the vagina below the uro-genital diaphragm.
Pelvis XIV.—median sagittal section with dissections from mid-line.
Pelvis XV.—median sagittal section with bladder and rectum distended.

(iii.) The rectum and anal canal. The rectum itself occupies the posterior part of the pelvis. It varies in size with its contents. When filled it may occupy the whole of the pelvic cavity behind the uterus (*vide* Pelves V. 4 and XV.). It then displaces the vagina and uterus forwards.

The rectum lies in a special compartment, the rectal channel, formed by the pelvic connective tissue. This is illustrated in Pelvis X. B 3, where the uterus and vagina have been drawn forward to open the rectal channel to its widest extent. The rectal channel is bounded by the recto-vaginal septum anteriorly (*vide* Pelvis XII.). When it is empty the rectum forms a narrow tube with its walls contracted. There is then a considerable space between the bowel and the wall of the channel. This space is filled with loose areolar tissue.

There is a sharp angle at the junction of the rectum and anal canal. The rectum down to this point is closely related to the posterior wall of the vagina, the recto-vaginal septum alone intervening between the two. When the anal canal turns back to pierce the pelvic floor and reach the surface the perineal body intervenes between it and the vagina.

The Pelvic Connective Tissue.

The viscera are set in the mid-line of the pelvis leaving plenty of space between them and the pelvic walls. The spaces between the peritoneum above, the pelvic walls laterally, the viscera medially and the pelvic floor below are filled with connective tissue. Developmentally all this tissue arises from the same embryonic layer. Bryce in Quain's "Anatomy" puts it very clearly:

> When the peritoneum is stripped off the upper aspect of the pelvic floor a thick substratum of connective tissue is exposed, covering the side walls and floor of the pelvic basin. Derived from the continuous and undifferentiated mesenchyme of the embryo, this tissue by local condensations provides connective tissue coats for the viscera, sheaths for the ducts, vessels and nerves which traverse it and epimysial lamellæ on the pelvic face of the muscles.

This paragraph was quoted previously in reference to the pelvic floor. It gives a concise and clear conception of the pelvic connective tissue as a whole. Examination of sections and dissections shows that the differentiation of this pelvic connective tissue has proceeded in different directions in various parts of the pelvic cavity. Thus we have structures formed which are capable of isolation by dissection. The fascial sheaths of the muscles, the coats of the viscera and the sheaths for the ducts, vessels and nerves may all be displayed by dissection. There is a danger in this that each may be treated as a separate and isolated structure, without reference to its intimate relations to the rest of the pelvic connective tissue. One of the main values of the study of sections is that it corrects these false impressions. The combination of section and dissection is of great use in arriving at a proper appreciation of the relative values of various structures.

A study of the series of specimens shows that the pelvic connective tissue is continuous around the viscera and their canals from the pelvic floor

to the peritoneum. It embeds them and passes around and between each structure. It fills up all the spaces between the viscera and the pelvic walls. It can be traced around the front and sides of the bladder, between the layers of the broad ligaments, around the vagina and *cervix uteri* and around the rectum and commencement of the anal canal. Pelves I., II., III., V. and VI. all show this arrangement.

In Pelvis I. 5, 6 and 7 the connective tissue between the layers of the broad ligament is seen in relation with the lateral borders of the body of the uterus medially and continuous with that on the side walls of the pelvis laterally. In Pelvis I. 8 and II. 5 the *cervix uteri* is surrounded by connective tissue, while the base of the broad ligament has widened out to accommodate a broad band of connective tissue which passes out to the pelvic wall. These layers and sheets of connective tissue form the parametrium. Pelvis III. 4 shows the continuity of the parametrium with the pelvic connective tissue in front of and behind it. In Pelvis X. B the parametric tissue is displayed running out to the pelvic wall from the uterus and vagina. The portion in relation to the vagina is sometimes referred to as the paracolpos, though the term is not in common use. In Pelvis XII. this tissue is seen from the posterior aspect. The uterine vessels and the ureters are running in its substance.

The pelvic connective tissue is continuous above the brim of the pelvis with the extraperitoneal connective tissue of the abdominal parietes. Fluid effusions, as blood or urine, and inflammatory exudate, as pus in pelvic cellulitis, may spread easily through these connective tissue planes. They may track over the brim of the pelvis and point in the abdominal wall or the lumbar region. When inflammatory exudate has infiltrated the pelvic connective tissue the organs feel on examination *per vaginam* as if they were set in plaster of Paris.

Below the level of the cervix the pelvic connective tissue surrounds the bladder, the base of the bladder, the vagina and the rectum. At this level some distinct sheets of fascia are developed by condensation with the connective tissue in relation with the rectum. The recto-vaginal septum is a well defined structure. It is seen in both section and dissection (*vide* Pelves I. 9, 10 and 11, II. 6 and 7, III. 5, IV., X. B, XII., where it is dissected out as a separate sheet, and XV.).

The septum is derived from the downward projection of the peritoneum which is found in the fœtus in the third and fourth month (Keith). At this stage the peritoneum descends between the vagina and rectum in the female to the level of the upper part of the perineal body. As development proceeds these layers fuse, but they remain as a septum extending across the pelvic cavity between the rectum and vagina and loosely attached to each by areolar tissue. Either structure may be stripped off the recto-vaginal septum quite easily along the plane of cleavage of areolar tissue. The septum corresponds to the prostato-peritoneal aponeurosis of Denonvilliers in the male, described by Elliot Smith as the recto-vesical septum.

The pelvic connective tissue around the rectum is organized into sheets of fascia which form a lining for the rectal channel. They are shown in Pelvis X. B 3. The rectal channel is completed anteriorly by the fusion of the recto-vaginal septum with the pelvic fascia, while the connective tissue of the utero-sacral ligament completes it laterally by forming a roof for the lateral part of the space.

Around the visceral canals the pelvic connective tissue becomes condensed and fuses with the pelvic fascia where it is reflected on to the walls of the urethra, the base of the bladder, the vagina and the anal canal, to form strong sheaths and coats for these structures. The neuro-vascular bundles (*vide* next section) spread out and fuse with these sheaths also as the nerves and vessels they contain reach the walls of the organs they supply. Thus we find that these organs are all firmly fixed to the pelvic floor by a fusion of three different sets of tissue—the pelvic fascia, the pelvic connective tissue and the sheaths of the neuro-vascular bundles. These three structures are all derived from the pelvic connective tissue as has been pointed out.

There is a certain amount of plain muscle tissue intermingled with the pelvic connective tissue. A block was cut from the parametric tissue removed from Pelvis X. A corresponding to that seen in Pelvis X. B. Sections were made of it and it was found to contain a quantity of plain muscle fibres. There is no definite arrangement in this muscle tissue except in the round ligaments and the utero-sacral ligaments, both of which are rich in plain muscle fibres. The exact distribution of plain muscle tissue in relation to the pelvic connective tissue requires to be worked out in detail.

There is no evidence in these sections or dissections of any separate bands of ligamentous tissue corresponding to those described by Mackenrodt as the lateral ligaments, by Koch as the cardinal ligaments and by Victor Bonney as the lateral cervico-pelvic ligaments.

A structure frequently referred to in gynæcological literature is the so-called "pubo-cervical ligament" or "pubo-cervical muscle." This term is applied to the condensed connective tissue which is associated with the angle between the base of the bladder, the uro-genital diaphragm and the medial margin of the *levator ani* on either side of the mid-line. It is analogous to the pubo-prostatic ligament in the male. If Pelvis I. 9 and 10 be examined it will be seen that the pelvic connective tissue in this region is dense, stretching from the lateral border of the vagina to the pubes and that, particularly in I. 10, it contains many blood vessels. This tissue is forming the sheath for the base of the bladder and urethra. The same arrangement is seen in Pelvis II. 7. In Pelvis III. 4 where the section just clears the vagina (78), this tissue is seen sweeping forwards from the parametrium, underlying the bladder and resting on the *levator ani*. Pelvis III. 6

shows it also (98). In Pelvis V. 2 and 2a it forms the tissue underlying the sides of the bladder between it and the *levator ani*. In Pelvis IX. 1 it is closely related to the base of the bladder, passing from the vagina to the pubes along the medial border of the *levator ani*. In Pelvis XIII. dissected from the front, it may be seen in the angle between the bladder, the uro-genital diaphragm and the *levator ani*, fused with all three and uniting them.

It is then a very definite structure, but it is not pubo-cervical in the strict sense of the term. It is pubo-vaginal, because it extends from the pubes to the sides of the upper part of the vagina. The tissue is of the same order as the pelvic connective tissue. It is really an extension forward and backward of the lateral true ligaments of the bladder. In order to be pubo-cervical the tissue must be followed up along the vagina to the sides of the *cervix uteri*, which gives the ligaments a strong curve and a much wider posterior border. Through this attachment to the connective tissue along the lateral borders of the vagina and cervix the pubo-cervical ligaments link up with the neuro-vascular bundles of the parametrium. Thus they receive an accessory attachment to the pelvic wall through these structures.

The extent, attachments and relations of the pelvic connective tissue may be studied in the following specimens:

Pelvis I. sections 5, 6, 7, 8, 9 and 10—horizontal.
Pelvis II. sections 5, 6 and 7—horizontal.
Pelvis III. sections 2, 3 and 7—sagittal.
Pelvis V. sections 2 and 2a, 3 and 3a and 4—coronal.
Pelvis VI. sections 2, 3 and 4—oblique.
Pelvis X. B 1, 2 and 3—dissection from mid-line.
Pelvis XI.—dissection from left side.
Pelvis XII.—dissection from posterior aspect.
Pelvis XIV. B—dissection from anterior aspect.

The Neuro-Vascular Bundles.

In all parts of the body where blood vessels and nerves run to supply limbs or organs, it is a general rule that they run in company. They are delicate structures that would be seriously damaged by tension. So they are enclosed and protected by sheaths of white fibrous tissue. They are thus bound into bundles which are frequently spoken of as neuro-vascular bundles. These bundles are packed round with areolar and fatty connective tissue for further protection and support and to confer on them a certain degree of mobility, Thus we have the carotid sheath, the axillary sheath, the femoral sheath and the arrangements of the vessels and nerves in the various compartments of the arms and legs.

In the pelvis the same arrangement holds. The bladder, uterus and vagina and rectum are active organs and require a rich blood supply. Most of this blood supply is drawn from the hypogastric artery on either side. The hypogastric vein receives the venous drainage. So that all the main vessels that pass to and from these three series of organs above the pelvic floor are arising from or passing to the postero-lateral quadrant of the pelvis where the hypogastric vessels lie. In Pelves X. A, XI., XII. and XIV. A the dissections show the hypogastric vessels situated in front of the sacro-iliac joint, descending into the pelvis opposite the greater sciatic foramen down to the vicinity of the ischial spine. In Pelvis I. 4, 5 and 6 and Pelvis II. 4 and 5 they are seen in section in this part of the pelvis. As they descend the artery gives off the parietal branches which proceed to the inner side of the thigh *viâ* the obturator foramen and the buttock *viâ* the greater sciatic foramen, namely, the obturator, superior gluteal, inferior gluteal and internal pudendal arteries. The hypogastric vein receives two or three tributaries from each area.

Within the pelvis, however, three sets of visceral branches are given off. They vary a good deal in the actual origin of each branch. But they form three main leashes, vesical arteries to the bladder, uterine and vaginal arteries to the uterus and vagina and middle hæmorrhoidal arteries to the rectum. These vessels pass out to the viscera running in three main leashes. The veins which drain the viscera, are much more numerous and are arranged in plexuses, the vesical plexus of veins draining the bladder, the pampiniform plexus draining the uterus and vagina and lying in the layers of the broad ligament and the middle hæmorrhoidal plexus from the rectum. These plexuses are rich and contain many thin-walled vessels; but they tend to concentrate into two or three main vessels in each plexus. These in turn drain into the hypogastric vein. The lymphatic vessels draining the viscera follow the same general plan as the veins. In addition the nerves to and from each organ are derived from the sacral nerve trunks and the hypogastric sympathetic nerves which lie in the postero-lateral quadrant of the pelvis in close proximity to the hypogastric vessels. So all these structures are focussed proximally in the region of the greater sciatic foramen and ischial spine. They radiate out in fan-shaped fashion as neuro-vascular bundles to the bladder, the uterus and the vagina and the rectum. They pass through the pelvic connective tissue. It is condensed round the neuro-vascular bundles in the form of sheaths which surround and support the vessels and nerves. The sheaths are attached to the fascia of the pelvic wall in the region of the greater sciatic foramen and ischial spine in virtue of their common development from the pelvic connective tissue, while medially the sheaths fuse with the fascial sheaths of the viscera. The pelvic connective tissue strengthens and supports the bundles.

In the dissections of Pelvis X. B the pelvic connective tissue lying beside the uterus and vagina is seen with its contained neuro-vascular bundles displayed from the anterior aspect. In Pelvis XII. this tissue is seen from the posterior aspect. It forms a dense, almost solid mass of tissue. This tissue forms the direct lateral support of the uterus and vagina, slinging them from the pelvic wall in the region of the greater sciatic notch and ischial spine.

On drawing the uterus and vagina forward (*vide* Pelvis X. B 3) the rectum is seen lying in the rectal channel. The middle hæmorrhoidal neuro-vascular bundle pierces the wall of the rectal channel and passes across to the lateral wall of the rectum as a definite fan-shaped structure encased in connective tissue. This is the so-called "rectal stalk." It supports the rectum laterally.

The vesical neuro-vascular bundles can be seen in Pelvis III. 3 and 7 and Pelvis V. 2 and 2a, where they are cut in section and form a part of the pelvic connective tissue. In Pelvis X. B 3 they can be seen passing forward to the base of the bladder from the parametric tissue. This demonstrates again the continuity of the pelvic connective tissue, but at this level it is more condensed and is contributing to the formation of the pubo-cervical ligament. Some of the higher parts of the vesical neuro-vascular bundles have been cut away and the mouths of the vessels can be seen in Pelvis X. B 2.

The Peritoneum.

The pelvic peritoneum in this series conforms to the usual description. It passes down from the posterior surface of the abdominal wall (*vide* Pelvis III. 5) and is reflected on to the upper surface of the bladder. The level of reflection varies, as has been shown, with the degree of distension of the bladder. Covering the superior surface of the bladder it is reflected on to the anterior wall of the body of the uterus, covers it and is reflected over the fundus, the dorsal aspect of the body and the supravaginal cervix on to the upper part of the vagina. It clothes the vagina for about ten millimetres and is reflected on to the rectum which it clothes.

Laterally it passes off the bladder on to the side walls of the pelvis forming the lateral false ligaments of the bladder. The level of reflection at the sides also varies with the degree of distension of the bladder; compare Pelvis V. 2 with Pelvis XII. Lateral to the uterus it forms the layers of the broad ligament, clothes the uterine tube, and forms the mesosalpinx and mesovarium by which the tube and ovary are attached and between the layers of which they derive their blood supply. The ovary is not covered with peritoneum. This stops at the "white line" of the ovary, the ovary beyond this line being covered by germinal epithelium. Laterally the peritoneum forms the infundibulo-pelvic fold through which the ovarian leash of vessels gains the interior of the broad ligament. It suspends the ovary by its superior pole from the pelvic wall and so it is also called the suspensory ligament of the ovary. A very important relation of this fold is the ureter. The relations of these two structures are discussed in detail below. At the brim of the pelvis they are very close together; the infundibulo-pelvic fold is from three to five millimetres anterior to the ureter. The ovary is attached medially to the uterus by the ovarico-uterine fold of peritoneum or the ligament of the ovary. The round ligament of the uterus raises the peritoneum in a ridge from the cornu of the uterus to the brim of the pelvis.

Attached to the back of the supravaginal cervix there is a fold of peritoneum which encloses the utero-sacral ligament. It forms the lateral boundary of the pouch of Douglas and curves back to the side of the rectum (*vide* Pelvis X. B 3). It passes beyond the rectum and is attached to the connective tissue on the front of the sacrum. The small peritoneal pouch between the utero-sacral fold and the lateral pelvic wall used to be described as the lateral pouch of Douglas.

The peritoneum is carried off the rectum on to the pelvic wall in the usual way. It is raised up by the distended bowel.

The Fixation of the Viscera.

The means by which the viscera and their canals are fixed in position are of great practical importance. In the study and treatment of displacements of the organs this knowledge is essential.

1. *The Supports of the Uterus.*—The uterus lies in the pelvis at a level somewhat above the pelvic floor. Its normal position is that of anteversion, with the cervix about sixty-five millimetres from the vaginal orifice and approximately on a level with the spines of the ischia and nearer the sacrum than the pubes, that is post-axial. It is usually in the mid-line.

There are three sets of supports which maintain the uterus at this level and in its normal position. The upper set is directly attached to the uterus itself while the lower sets support it indirectly.

Direct Supports:

(i.) the upper set comprises: (*a*) The broad ligaments, (*b*) the round ligaments, (*c*) the utero-sacral ligaments, (*d*) the neuro-vascular bundles of the pelvic connective tissue.

Indirect Supports:

(ii.) The middle set (dynamic or active) consists of the *levatores ani* muscles.

(iii.) The lower set (passive) consists of the uro-genital diaphragm and the perineal body.

(i.) The Upper Set.—(*a*) The broad ligaments are attached to the lateral borders of the uterus. They are broad, wing-like, double folds of peritoneum with a small amount of pelvic connective tissue between their layers. While not very strong in themselves they help to suspend the uterus in the pelvis.

(*b*) The round ligaments are fibrous and muscular strands which pass from the cornu of the uterus antero-laterally and passing through the inguinal canal they receive a fibrous attachment to the pubis. They vary in size and strength. There is plain muscle tissue intermingled with the fibrous tissue which forms them. The round ligaments are representatives of the *gubernaculum* of the ovary, the remainder of which is represented by the ovarico-uterine ligaments. They act mainly as guy ropes, assisting to hold the fundus forwards so that the

intraabdominal pressure falls on its posterior wall. In retroversion of the uterus these ligaments are found to be lengthened.

(*c*) The utero-sacral ligaments are strong, stout bands of fibrous and plain muscle tissue which pass from the back of the supra-vaginal cervix to the front of the sacrum. They are well shown in Pelvis X. B 3. They are enclosed in the utero-sacral fold of peritoneum. They assist in supporting the cervix at its proper level and help to hold it back towards the hollow of the sacrum.

(*d*) The neuro-vascular bundles have been described in detail. They are the most important of the direct supports of the uterus. They sling the cervix, the body of the uterus and the vault of the vagina from the lateral pelvic wall and maintain them at their proper levels in the pelvis.

(ii.) The Middle Set (Dynamic or Active).—The *levatores ani* have been described in detail. By supporting the pelvic contents in general they support the uterus indirectly. They consist of active muscle tissue and possess contractility and tonus. Their tension may vary very much. As long as they are strong and intact, they lend strong support to the pelvic contents. They are attached directly to the lateral wall of the vagina and give it strong support. They also act as strong sphincters for the vagina.

(iii.) The Lower Set (Passive).—The uro-genital diaphragm and perineal body which have been described in detail, form a firm passive support strengthening the *levatores ani*. If the perineal body is split the *levatores ani* separate. This weakens their sphincteric action on the genital hiatus and very greatly diminishes their supporting powers. These structures also give direct support to the lower part of the vagina.

2. *The Supports of the Bladder and Urethra.*—The bladder is supported weakly by its lateral false ligaments, the peritoneal reflection and by the urachus attached to the apex.

The strong supports of the bladder are:

(*a*) The pubo-cervical ligaments.
(*b*) The *levatores ani*.
(*c*) The uro-genital diaphragm.
(*d*) The vagina and *cervix uteri*.

The pubo-cervical ligaments afford direct, strong support to the base of the bladder. They are attached to the pubes anteriorly and to the vagina and cervix posteriorly. Through the latter they gain a secondary support from the lateral pelvic wall through the neuro-vascular bundles of the parametrium and paracolpos.

The medial margins of the *levatores ani* directly support the base and sides of the bladder on either side of the genital hiatus.

The uro-genital diaphragm is a strong general support for the bladder and the urethra. It affords reinforcement to (*a*) and (*b*). Through it the urethral sphincter gains attachment to the pubic rami which affords it a *point d'appui* in contraction.

The vagina and *cervix uteri* support the base of the bladder. By their attachments to the pelvic wall they help to hold it up. If they fall, it falls too.

3. *The Supports of the Rectum and Anal Canal.*—The rectum is loosely supported by the neuro-vascular bundles of the middle hæmorrhoidal vessels where they form the rectal stalk on either side. Above it receives support by its continuity with the pelvic colon. Below it rests on the *levatores ani*.

It also has direct attachment to the front of the sacrum by several sheets of white fibrous connective tissue which are attached to the wall of the bowel inferiorly and to the front of the sacrum superiorly (*vide* Pelvis III. 5). This was also demonstrated by the author in a paper on "The Anatomy of *Procidentia Uteri*."

The anal canal is firmly supported by the perineal body and the base of the uro-genital diaphragm, *levatores ani* and the ano-coccygeal *raphé*. It has a further strong support laterally by the *lamina terminalis* (*vide* Pelvis V. sections 3 and 3a).

The Relations of the Ureters.

The relations of the ureters are of such great importance from a practical surgical point of view that it has been deemed advisable to devote a special section to them.

There are three points at which the relations of the ureters are of importance to the operating surgeon. These are: (i.) At the brim of the pelvis, on account of its close association with the infundibulo-pelvic fold, (ii.) in the base of the broad ligament, on account of its relation to the uterine vessels and to the *cervix uteri*, (iii.) at the lateral angle of the bladder on account of its relation to the vagina.

In general terms it may be said that the ureter enters the pelvis at the postero-lateral angle by crossing the external iliac artery just anterior to the bifurcation of the common iliac artery. It descends almost vertically into the pelvis on the lateral wall lying almost directly in front of the hypogastric artery and about one to three millimetres from it. It lies directly under the peritoneum. These relations are shown in the following specimens:

Pelvis I. 3, 4 and 5 (on both sides).
Pelvis II. 3 and 4 (right side).
Pelvis III. 3.
Pelvis X. B.
Pelvis XI. 1.
Pelvis XII. 2.
Pelvis XIII.
Pelvis XIV. A.

At the brim of the pelvis the ureter is closely related to the infundibulo-pelvic fold. The latter contains the ovarian leash of vessels. Thus in Pelvis I. 3 it is five millimetres posterior to the infundibulo-pelvic fold, in Pelvis II. 3 it is three millimetres posterior to the infundibulo-pelvic fold, in Pelvis III. 3 it is three millimetres posterior to the infundibulo-pelvic fold, in Pelvis X. B it is four millimetres posterior to the infundibulo-pelvic fold, in

Pelvis XI. 1 it is two millimetres posterior to the infundibulo-pelvic fold, in Pelvis XII. 2 it is three millimetres posterior to the infundibulo-pelvic fold, in Pelvis XIII. it is five millimetres posterior to the infundibulo-pelvic fold.

Therefore, if the infundibulo-pelvic fold be picked up to be ligatured, the ureter will be carried up with the peritoneum. If the ligature be placed close to the pelvic wall, the ureter on account of its close proximity is in great danger of being included in the ligature.

The ureter runs vertically downward under the peritoneum parallel with and in front of the hypogastric artery for twenty to twenty-five millimetres. It is medial to the obturator nerve, while the obturator artery and obliterated hypogastric artery pass forward lateral to the ureter, between it and the pelvic wall. In all the pelves in this series the uterine artery arises from the obliterated hypogastric artery anterior to the ureter and it runs down anterior to and almost parallel with the ureter.

The ureter does not descend as low as the spine of the ischium at this stage. About twenty-five millimetres below the brim of the pelvis it begins to curve gently forwards and inwards, lying immediately under the peritoneum and firmly attached to it, so that when the peritoneum is lifted, the ureter is carried with it. It follows the curve of the pelvic wall and passes into the base of the broad ligament on a level, approximately, with the *cervix uteri* and the spine of the ischium. In this part of its course it forms the posterior boundary of the *fossa ovarica,* the peritoneal depression in which the ovary lies.

In Pelves X. B, XI. 1, XII. and XIV. A of this series the uterine artery runs down to the point where the ureter enters the base of the broad ligament lying anterior to and parallel with the ureter.

Now the uterine artery commences to turn inwards towards the uterus. It lies above and crosses the ureter, while the ureter continues its course forwards and slightly inwards towards the lateral angle of the bladder. The angle at which they cross, is not a great one. Indeed the ureter lies nearly parallel with the uterine artery at the point of crossing. The distance at which the ureter lies from the cervix at the point where the uterine artery crosses it, varies considerably. This depends on the degree of asymmetry of the uterus and vagina. In this series the measurements are shown in the accompanying table

Pelvis and Section.	Distance (in millimetres) between the Cervix and	
	the Left Ureter.	the Right Ureter.
Pelvis I.—		
Section 7 (lateral to cervix) ..	20	15
Section 8 (in front of vagina) ..	8	10
Pelvis II. (uterus drawn to right)—		
Section 5 (lateral to cervix) ..	17	40
Section 6 (in front of vagina) ..	4	10
Pelvis XII. (uterus drawn to right)	40	?15

In the other pelves the measurements on both sides are not available. But these show the amount of variation there is in regard to the distance of the ureter from the cervix.

The ureter passes forwards and inwards to reach the lateral angle of the bladder which it enters obliquely. Here again it is subject to considerable variation. James C. Brash has studied the relation of the ureters to the vagina at their entrance to the bladder, that is at the lateral angle of the bladder. He arrived at the following conclusions:

1. The relation of the last portion of the ureter to the vagina is variable. There is usually a portion of the ureter in front of the vagina, lying for a short distance in the connective tissue between vagina and bladder and then in the wall of the bladder itself.
2. With the vagina and bladder symmetrically related to each other this portion of the ureter is equal on the two sides; but deviation from the symmetrical position is the rule. The result is an increase of this portion of the ureter on one side and a corresponding decrease on the other. There is frequently no ureter in front of the vagina on one side and therefore a much longer portion than usual on the other side.
3. In the majority of the specimens examined it is the left ureter that has the greater relation to the vagina and it is occasionally found crossing the middle line of the vagina.
4. As a rule, therefore, the left ureter is in a position of greater danger than the right, both in operative work and from the point of view of the formation of a ureterovaginal fistula as a result of pressure. It must not be forgotten, however, that occasionally the position may be reversed.
5. The "normal" asymmetrical position of the uterus in the pelvis is explained by the fact that an asymmetrical position of bladder and uterus is early established while these organs are still in their abdominal situation, by the subsequent greater relative descent of the bladder and its reassumption of a median position in the true pelvis which accentuates the asymmetrical position of the uterus and rotates it around its long axis.

Brash's conclusions are borne out in this series. The asymmetry of the uterus is, however, more to the right side, so that the right ureter is closer to the vagina.

The Pelvic Floor in Parturition.

In obstetrical textbooks in general the description by Berry Hart of the changes in the pelvic floor during parturition has been adopted.

Hart uses two descriptions, one in sagittal median section and one in transverse section. These are based on frozen sections that he made and studied.

In sagittal median section he takes the vagina as the dividing plane. All in front of it forms the "pubic segment"; all behind it forms the "sacral segment."

The pubic segment is made up of bladder and anterior vaginal wall and is loosely attached to the pubis, the retropubic fat filling up the pyramidal space bounded by urethra, anterior wall of bladder and posterior aspect of symphysis.

The sacral segment is made up of the strong muscular tissue inserted into the sacrum and includes the rectum in part and the posterior vaginal wall.

Hart says: "This division of the pelvic floor into two segments is an exceedingly convenient one, but

holds strictly true only for sagittal median sections."

In parturition, by the contraction of the circular muscular fibres of the uterus and the shortening of the longitudinal ones the *cervix uteri* is elongated and dilated and the child driven down. Now the anterior lip of the cervix is fixed to the postero-superior angle of the pubic segment, the posterior lip of the cervix to the upper part of the sacral segment and therefore during parturition the pubic segment is drawn up above the symphysis, the sacral one is driven down, a movement which Hart compares to "two swinging bank doors."

The proof of this is, according to Hart, as follows:

(1) Braune's section.
(2) Chiari's section and Chiara's section.
(3) Labat's dissection of a body (second stage).
(4) The empty or little distended bladder can often be felt above the pubis during the first stage.
(5) It is permitted by the loose attachment of the bladder to the pubis and the upward tension exercised on the pubic segment during labour.

This is Hart's classical description. But what actually happens?

The cervix being fully dilated the passenger has to pass down through the vagina, slowly dilating it and the surrounding structures. Does the cervix change its level anteriorly and posteriorly? Examination of Braune's, Chiari's and Chiara's section of the second stage, which are given in Plate IV of Barbour's "Anatomy of Labour," all show that the external *os*, though fully dilated, retains its general relations to the plane from the symphysis to the coccyx. It has expanded to the diameter of the pelvis, but it has neither ascended nor descended as far as its bony relations are concerned.

The bladder has apparently risen above the symphysis, but this is only the flattened and stretched upper part. The organ is long and narrow and the position of those parts attached to the uro-genital diaphragm has not altered. The urethra retains its position and the lower part of the vagina is in the same position. So that the lower part of the pubic segment does not move. How can it? It is firmly anchored, as has been shown, by the uro-genital diaphragm to the ischio-pubic rami. The loose bladder may be pulled or squeezed up, but the parts supporting the base of the bladder remain and must be stretched by the descending head or other presenting part.

The presenting part must, therefore, dilate or push outward the medial margins of the *levatores ani*, the uro-genital diaphragm and the perineal body. At the same time the posterior part of the pelvic floor is stretched out over the presenting part. If the passenger comes through slowly and gently, the muscular and fibrous tissues, softened by the processes of pregnancy, gradually dilate and allow it through. But if undue force is used, either by the powers or by the forceps, these supports are lacerated to a greater or less degree. This will mean a permanent weakening of the pelvic floor to a greater or less degree.

PART III.

SUMMARY.

1. The bony pelvic ring is complete at the pelvic inlet.

2. The obturator membrane and the sacro-tuberous and sacro-spinous ligaments confer a certain amount of resiliency on the antero-lateral and postero-lateral portions of the pelvic wall. These lie in the diagonal conjugates.

3. On either side is a quadrate mass of bone forming a strong, unyielding lateral pelvic wall.

4. The joints in the pelvis allow for a certain degree of expansion and elasticity in the bony ring in pregnancy and parturition.

5. Owing to this and to the constant stress upon them in transmitting the weight of the body to the lower limbs, the sacro-iliac joints may become sites of chronic weakness giving rise to pains and backache.

6. The pubes, spines of the ischia and coccyx are in the same plane; so are the origins of the *levatores ani*.

7. The pelvic floor consists of all the structures from the pelvic fascia to the skin; that is, the muscular pelvic diaphragm (*levatores ani* and *coccygei*), the uro-genital diaphragm or triangular ligament, the perineal body, the ischio-rectal fossæ and the superficial structures of the vulva.

8. The *levatores ani* consist of two main parts: (i.) A stout bifurcated muscle sling extending from the coccyx to the anal canal and thence by two limbs to the pubes. This comprises the *pubo-rectalis* and *pubo-coccygeus* portions usually described. It is strengthened and supported by the ano-coccygeal *raphé*, the perineal body and the uro-genital diaphragm. The muscle tissue forms a strong active or dynamic support. The supporting tissues are passive and have firm bony attachments to the margins of the bony pelvic outlet. This portion of the *levator ani* bounds the genital hiatus, acts as a sphincter for the vagina and slings the anal canal up to the pubes. (ii.) The remainder of the muscle forms a thin fan-shaped sheet forming the roof of the ischio-rectal fossa.

9. The *coccygei* are often vestigial, being mainly fibrous.

10. The uro-genital diaphragm is a stout supporting structure attached to the ischio-pubic rami. It affords a strong bony attachment for the urethra and vagina and the perineal body. It strongly supports the *levatores ani* on either side of the genital hiatus.

11. The terms parietal and visceral pelvic fascia as at present used should be discarded. The only true visceral fascia is that actually reflected over the viscera. The remainder should be described by the name of the muscle it covers.

12 .The perineal body is firm and strong. It is slung from the *tuber ischii* by the bases of the uro-genital diaphragm and from the coccyx by the ano-

coccygeal *raphé*. It is an important constituent of the pelvic floor. It holds the medial margins of the *levatores ani* together, completing the genital hiatus. Tearing of the perineal body causes gaping of the genital hiatus.

13. The clitoris is described in detail.

14. The pelvic connective tissue forms a packing for the viscera and their canals and a general support as well.

15. The neuro-vascular bundles are reinforced by the pelvic connective tissue. They assist in suspending the viscera.

16. The viscera are fixed by a series of supports which are described in detail. In general they are suspended from the pelvic walls by special thickenings of the pelvic connective tissue and by the neuro-vascular bundles. They are strongly supported below by the pelvic floor. An intact pelvic floor means well supported pelvic contents.

17. The ureters have three danger points: (i.) at the pelvic brim where they are only three to five millimetres posterior to the infundibulo-pelvic folds, (ii.) at the base of the broad ligament where they are crossed by the uterine artery, (iii.) where they enter the lateral angle of the bladder, because their relation to the vagina varies very considerably owing to the asymmetry of the vagina and uterus.

18. Berry Hart's description of a movable pubic segment and a fixed sacral segment opening "like swinging doors" will not hold. The pelvic floor is entirely fixed both anteriorly and posteriorly. It can only open by stretching of the margins of the genital hiatus. Too rapid or too forceful delivery must damage the pelvic floor.

19. In Part IV. sixteen pelves are described in detail with fifty-nine photographs of sections and dissections. The whole of the descriptions and conclusions embodied in the work are based on these specimens.

(To be continued.)

Reports of Cases.

HERPES ZOSTER AND VARICELLA OCCURRING SIMULTANEOUSLY IN THE SAME PERSON.

By R. L. THOROLD GRANT, M.B. (Adel.), M.R.C.P. (Lond.),

Honorary Assistant Pathologist, The Adelaide Hospital, Adelaide.

THE patient is a woman of thirty-seven years of age. For four years she has suffered from Hodgkin's disease, the progress of which has been kept in check by applications of deep X ray therapy to the affected parts. Signs of enlarging glands in the mediastinum recently necessitated further application of X rays. A few days after the last exposure she developed a severe attack of *herpes zoster* along the course of the sixth thoracic nerve on the left side. This was followed in a few days by an equally severe attack of *herpes zoster* along the course of the seventh thoracic nerve on the right side. The upper limit of the right side rash blended with the lower limit of the left side eruption anteriorly and posteriorly and thus appeared the unusual sight of a person completely encircled with herpes. The pain was intense and necessitated administration of morphine. At the height of the *herpes zoster* eruption the patient developed typical generalized varicella. The rash was profuse on the chest, back, abdomen, scalp and scattered on the extremities and face. There were vesicles within the mouth.

Dr. Stanley Verco who administered the X ray therapy tells me that *herpes zoster* apparently follows applications of X rays, as he has observed about a dozen instances in the course of a large series treated by him. There is a mild epidemic of varicella in Adelaide at present and the patient had not been infected in childhood.

The case is of interest in view of the association between varicella and *herpes zoster*. Simultaneous occurrence of these diseases in the same person must surely be a rare event.

Reviews.

NASAL ACCESSORY SINUS.

THE work on the nasal accessory sinuses by Professor Dr. M. Hajek of Vienna, of which this is the fifth edition, forms a textbook of foremost value.[1] The English translation by J. D. Heitger and French K. Hansel is presented in two compact volumes of three hundred pages each in clear type and profusely illustrated.

The first volume is divided into a general part which commences with a clear description of the anatomy of the paranasal sinuses. This is followed by their pathology and this section covers the latest work done in this field.

The chapters of general symptoms and diagnosis are most practical.

The special part deals with each individual sinus in turn under the headings "Pathological Anatomy," "Symptoms," "Diagnosis and Therapy." Commencing with the maxillary sinus, the author sets out clearly the indications for either conservative or radical operation in individual cases. In the radical operation his advocacy of curetting the infected mucosa instead of stripping it from the inner bony antral walls is not approved by many surgeons.

The second volume deals first with inflammation of the frontal sinuses under similar headings. His conservative treatment leaving the radical operation only for those cases in which it is the only therapeutic measure available, is much appreciated.

The ethmoidal labyrinth is dealt with in a masterly way, operative treatment being on conservative lines, stress being laid on the essential necessity of free ventilation and drainage. The endonasal route is generally taken, only in exceptional cases is the external operation indicated.

In regard to the sphenoidal sinus the description of the differential diagnosis is discussed and indications for particular operative interference are clearly defined.

In a chapter on the affections of the accessory sinuses associated with ozena there is most interesting reading. The author points out that in the earliest cases there is always a localized source of secretion, though it is not always found on clinical examination. Though he differs from many recognized authorities, his findings are very clearly and practically set out.

The final chapter on complications is most complete; under those of the orbit and visual organs retrobulbar neuritis is carefully considered. Cerebral complications are also well described.

The value afforded by X ray films in the diagnosis of sinus affections is emphasized throughout. The work has most extensive references to the literature at the conclusion.

Altogether this is a most able work and cannot fail to be most highly regarded by all specialists in the subject.

[1] "Pathology and Treatment of the Inflammatory Diseases of the Nasal Accessory Sinuses," by Professor Dr. M. Hajek, Translated and Edited by Joseph D. Heitger, A.B., M.D., and French K. Hansel, M.D., M.S.; Fifth Edition; Volumes I. and II.; 1926, St. Louis; the C. V. Mosby Company. Royal 8vo., pp. 724, with illustrations. Price: $17.00 each net.

The Medical Journal of Australia

SATURDAY, FEBRUARY 5, 1927.

A Retrospect.

Physiology.

Considerable interest is manifest in various parts of the world in the work of Royle and Hunter on the sympathetic innervation of the skeletal muscles. Very contradictory results have been obtained by different investigators. Several observers have been unable to substantiate the claims that the sympathetic nerves control in large measure plastic tonus in skeletal muscle. Some of the experiments were carried out by methods said to be the same as those used by Royle and Hunter. Other workers adopted new methods of approach. Some of the failures were undoubtedly due to faulty technique. For example one author did not observe any vasomotor changes or evidence of change in the limb muscles after repeated ramisection. A. Forbes and S. Cobb performed decerebration on cats sometimes before, sometimes after sympathetic ramisection and were unable to discover any uniformity in the variations in rigidity on the two sides of the body. They suggest that at the sympathetic nerve endings in skeletal muscle a chemical effect of some sort is produced which alters the state of the muscle and in some way that is yet to be explained, counteracts the effects of fatigue. They consider that there is no experimental justification for differentiating two distinct components, contractile and plastic, in the tonus of skeletal muscle. A. St. G. Huggett and J. Mellanby, using adrenalin and "Ergamine," drugs known to affect sympathetic nerve endings, were unable to show that these drugs had any effect on muscle tone or on the strength of contraction of a muscle. On the other hand A. Kuntz and A. H. Kerper in a series of very carefully controlled experiments confirm the general results of Royle and Hunter. Whereas in the observations of previous observers estimation of the tonus of muscles was largely a matter of personal judgement, these investigators have devised an ingenious mechanism for obtaining a graphic record of changes in tone and have shown, apparently unequivocally, that the tonus of muscles is very materially reduced as the result of the elimination of the sympathetic nervous supply. They have also demonstrated by the graphic method that cerebellar reflexes are an important factor in the component of muscle tonus which is mediated through the sympathetic nervous system.

J. Mellanby has thrown some new light on the secretion of pancreatic juice and the part played by secretin. According to the work of Bayliss and Starling secretin is derived from prosecretin which exists in the intestinal mucosa, by the action of the acid of the chyme. It is absorbed into the blood and is carried to the pancreas which it excites to secrete. The hypothesis is put forward by Mellanby that the mechanism of the pancreatic enzymes is under the control of the vagus nerves and that secretin causes the cells of the pancreas to produce a copious flow into the intestines of secretion containing the enzymes. He further claims that secretin exists in a preformed condition in considerable quantities in the mucous membrane of the upper two-thirds of the small intestine. It may be extracted by means of widely varying solvents, such as water, sodium hydrate solution, alcohol, acetone and hydrochloric acid. This preformed secretin exists in considerable quantity in the small intestine of the fœtus. Later he has shown that bile in solutions of certain hydrogen ion concentrations forms the most efficient solvent of secretin. This fact offers an adequate basis for the appreciation of the severe digestive disturbances which occur in catarrhal jaundice.

The description by Henderson and Haggard of the ethyl iodide method for determining the amount of blood ejected at each beat by the heart in man has aroused much interest in problems connected with the measurement of the circulation. W. Cullis, O. Rendel and E. Dahl have investigated the circulation rate in women by means of the ethyl iodide method. They have found that the right side of the heart puts out on an average 1·7 cubic centimetres of blood per kilogram of body weight. Henderson and Haggard found 1·3 to 1·8 cubic centimetres per kilogram in their subjects. J. W. Moore attempted to determine the lowering of the circulation effici-

ency in patients with heart disease, but had discouraging results. I. T. Rosen and H. L. White have used the method to examine the relation of the pulse pressure to the stroke volume. They found that when the diastolic pressure and pulse rate are constant, the pulse pressure is directly proportional to the stroke volume. The method can be used to determine variations in the ratio only in the same subject. O. W. Tiegs has evolved a new conception of the neurone and of neurone junctions in the cord. He claims to have shown that the neuro-fibrillæ are not mere fixation artefacts, but are the actual conducting units of the neurone. A single nerve fibre contains as many conducting paths as there are neuro-fibrillæ. An individual fibril may act as a final common path in a reflex arc, so that different types of reflexes in which the same effectors are concerned for similar or varying purposes, may act through wholly different final paths, each neuro-fibril supplying such a path. By histological methods he claims to have shown that the fine collaterals that enter the grey matter from the white matter of the spinal cord, converge upon the nerve cells of the grey matter and penetrate the dendrites of the nerve cells, being continuous with and indeed quite indistinguishable from the neuro-fibrillæ of the nerve cells. These fine collaterals, having entered the nerve cells, pass independently of one another as the neuro-fibrils towards the middle of the nerve cell where they anastomose. From this anastomosing system a small number of neuro-fibrils arise and emerge through the axone. The anastomosing system seems to be the seat of the integration. It is concluded that a true neurone continuity occurs at the junction of neurones in the spinal cord.

Hygiene.

Hygiene has been defined as the science that treats of the laws of health and the methods of their observance. In its widest sense, therefore, it would embrace the physiology of the individual from the impregnation of the ovum till death, the habits and customs of people from the cradle to the hearse, the relation of man to his neighbour and the means of disposing of man's waste products, of the material he handles but does not consume and of his body after dissolution. Such a conception would be useless for the purpose of this review of progress. Hygiene is here restricted to the science of the protection of man from the noxes that he encounters throughout his life and in all life's vicissitudes. Even with this limited significance of the word, it will be found that some overlapping with other divisions has been unavoidable.

The year 1926 has been characterized by steady progress. Knowledge has been accumulated as a result of experience and of direct investigation. The work of the health organization of the League of Nations has continued and still holds a high place in the effort to combat preventible disease in the mass. Similarly the International Health Board of the Rockefeller Foundation has extended its activities and has expended vast sums of money and a great amount of energy in its campaigns. Hookworm, yellow fever, malaria and tuberculosis claim the attention of this wonderful organization. Of the achievements in preventive medicine and hygiene by government departments in the various countries of the world little need be said. There has been a gradual transition during the past decade in the majority of enlightened countries from the old sanitary control toward modern hygienic principles. In some the movement has been relatively rapid, in others it has been very slow. In Australia the steps taken towards the application of the recommendations of the Royal Commissioners of Health indicate that a speeding up in the reform is about to begin and that great changes may be expected within the next year or two.

Several writers have dealt with the health of seamen. Among them F. Humbert has drawn attention to remediable defects on board ships and to the special hazards of a seaman's life. The close proximity of seamen to one another in ill-ventilated and narrow chambers necessitates precautions of a special kind to prevent infection.

In tropical hygiene much good work has been completed. Australia may soon possess its school of tropical medicine and hygiene and when this is established in the University of Sydney it is anticipated that its benefits will be extended to the remote islands scattered throughout the Pacific.

Industrial hygiene has been introduced into Australia but has not yet made headway. Industrial firms have still to be persuaded that it is economical

to have full regard to the health of employees, to avoid fatigue, to eliminate undue mental strain and to render the working environment as comfortable and hygienic as possible. But few firms in Australia employ a whole-time industrial hygiene medical officer. Much highly important statistical information is being collected in many parts of the world. Silicosis has been prominent among the subjects that have been investigated. E. L. Collis has published in our columns an admirable summary of the knowledge possessed at the present time on this disease. E. H. Kettle has completed some useful work and has demonstrated that lung tissue containing silica is actually a favourable medium for the growth of the tubercle bacillus.

B. Slater and W. Sawyer have shown that the institution of early treatment of syphilis results in the prevention of complications and in the reduction of disability of workers and is therefore an economical expedient. Some important work has been carried out on the question of zinc poisoning. Workers in zinc have been found to be liable to lead, cadmium and arsenic poisoning from the impurities of the zinc ores. Zinc itself has been shown not to produce toxic effects under industrial conditions. Further knowledge concerning the toxicology of lead has been accumulated by several workers. The question of dermatitis arising in the course of the occupation of house painting has been investigated and the part played by benzol, naphtha, turpentine and other solvents has been traced.

The Medical Research Council has published a very valuable report by R. J. Lythgoe on illumination and visual capacities. The work is largely physiological, but it contains a mass of information that must prove of great value to the maintenance of health of the people.

Biological Chemistry.

The past year has seen the same vigorous activity in those branches of biological chemistry which have been the subject of study during the last decade. Chemical technique has been improved in many details. Particularly has attention been given to the evolution of more accurate methods of dealing with small quantities of body fluids. The study of nutrition still shows no signs of any diminution in the number of experiments in which rats and mice are fed with different diets nor in the enthusiasm with which the results of such experiments are used to draw far-reaching generalizations as to the nutrition of man and animals.

Attention may be directed to the problem of the production of ammonia in the human and animal body about which several studies have been made. It has long been known that a quantity of ammonia is excreted in the urine. This amount of ammonia varies very considerably in different persons. It increases greatly in certain pathological states, especially when organic acids are present in the urine in larger quantities than usual. It has been thought that the amount of nitrogen excreted as ammonia is increased and the amount of nitrogen excreted as urea diminished when organic acids as diacetic acid and β oxybutyric acid are accumulating within the body. Some have held that the proportion of nitrogen excreted as urea and the proportion of nitrogen excreted as ammonia, are determined by the degree of acidosis of the body. More or less connected with these views has been the assumption that ammonia was produced in the liver in association with the removal of amino groups from protein and with the synthesis of urea.

In 1921 Nash and Benedict put forward the view that ammonia formation in the animal body is exclusively of renal origin. Their view has been widely accepted, though based on the single fact that the renal blood in the renal vein manifests two or three times the concentration of ammonia found in arterial blood passing to the kidneys. Against this hypothesis Sydney Bliss, working in Folin's laboratory at Harvard, has advanced the results of much investigation. The most important part of this study is the discovery that ammonia is excreted into the stomach and may be removed from the body by vomiting. The formation of ammonia for the neutralization of acids is said to be the function of all tissues. Just as acid production goes on throughout the body, so does ammonia formation. It would seem that the blood leaving most organs of the body contains more ammonia than the blood passing to them. Nash and Benedict, in reply, contend that the amount of ammonia in the blood is so

low that the ammonia found in the urine when the quantity is high cannot possibly be ammonia separated from the blood, but must be ammonia produced in the kidneys. It would appear desirable to know what happens to animals whose kidneys have been removed. It is as yet uncertain whether ammonia increases in the blood or not. If ammonia excretion into the alimentary canal does not occur, the ammonia in the blood increases according to Bliss, whereas Nash and Benedict state that under no circumstances does ammonia accumulate in the blood of denephrectomized dogs. Further investigations will be awaited with interest.

Considerable attention has been given to the statement by Warburg that he has been able to establish differences in the behaviour of cancer cells and of other normal tissue cells in respect to carbohydrate metabolism. Warburg contends that the cancer problem is a problem of cell physiology. Like normal organs, cancerous tumours consume oxygen and give off carbon dioxide. The veins of the growth contain less oxygen and more carbon dioxide than the arteries of the growth. The venous blood also contains less glucose than the arterial blood. The tumour, however, produces lactic acid which passes into the venous blood. Careful measurements have shown that a large number of malignant growths, such as transplanted rat carcinomata and sarcomata, the Peyton Rous chicken sarcoma, tar carcinomata in rabbits show a quantitative conversion of glucose to lactic acid to the same extent. Warburg contends that this is a general characteristic of carcinoma and sarcoma cells entirely independent of the particular kind of irritation or of the nature of the normal tissue in which the tumours originate.

Warburg has shown that cancer cells produce lactic acid at all times and in the presence of oxygen, whereas normal cells produce lactic acid only when their supply of oxygen is limited. This is summed up in the statement that the tumour so far as its metabolism is concerned behaves always as a normal growing cell in a state of asphyxia. Warburg is inclined to believe that the asphyxiation of normal growing cells is sufficient to produce the cancerous state. He contends that the cancer cell is simply a normal cell with deranged metabolism.

Current Comment.

THE SIGNIFICANCE OF GASTRIC ANACIDITY.

THE absence of acid from the gastric secretion in malignant disease of the stomach and in pernicious anæmia is an established fact and has been used for diagnostic purposes in both conditions. Reports have also been made of failure to discover acid in the stomach of patients suffering from many other diseases and, moreover, many apparently healthy people have been found to manifest the same phenomenon. If the finding or failure to find acid in gastric secretion is to be used in diagnosis, several conditions are necessary. In the first place it must be clear to what extent anacidity actually occurs, in what clinical and pathological states it is found and what are the circumstances apart from disease, if any, which induce it. In the second place the method of testing for the presence of acid must be such that the percentage of error is reduced to a minimum. Reference has recently been made in the columns of this journal to this subject in connexion with some observations by Faber on *achylia gastrica* (see THE MEDICAL JOURNAL OF AUSTRALIA, August 28, 1926). It was pointed out that the regurgitation of alkali from the duodenum had to be considered in the presence of apparent achlorhydria, that nervous stimuli may act as a deterrent and that the gastric glands may be destroyed as a result of pathological change with resulting absence of acid. The suggestion was also made that a disorderly hormonic action may cause abnormality or even suspension of secretion. Apperly has shown that each person has his own type of acidity and that consequently a lesion will have more effect in producing symptoms in one person than another.[1] He holds that movement is the central factor in acidity and its variations, provided that the gastric mucosa is healthy and that achylia of congenital origin is not present. He has also emphasized the fact that gastric acidity can be raised by increasing the rate of emptying of the stomach, decreasing the rate of alkali reflux or by increasing the rate of secretion of the gastric juice. Of these three factors the secretion of the gastric juice varies probably very little, except when the gastric mucosa is actually destroyed or in certain cases of inborn defect. This among other findings has been demonstrated in a recent investigation into the significance of gastric anacidity by Dr. C. S. Keefer and Dr. A. L. Bloomfield.[2]

They have based their study on fifteen hundred consecutive gastric analyses made on patients entering general medical wards. The diagnosis was based on the absence of free hydrochloric acid as tested by dimethyl-amido-azo-benzol in the gastric contents forty-five minutes to one hour after ingestion of the Ewald meal. The patients were not selected, but the examinations were made as part of a general diagnostic study. Of the total number of patients 780 were males and 720 were females.

[1] Transactions of the Australasian Medical Congress (British Medical Association), Melbourne, 1923. Supplement to THE MEDICAL JOURNAL OF AUSTRALIA, March 1, 1924.
[2] *Bulletin of the Johns Hopkins Hospital*, November, 1926.

Their ages varied from 10 to 81 years. There were 390 instances of anacidity or 26% of the total number. After the elimination of patients with known disease of the stomach "such as carcinoma and so-called pernicious anæmia" the percentage was 20. When the patients were taken in groups it was seen that 178 suffered from disease of the stomach. In these the incidence of anacidity was over 40%. Patients without organic disease numbered 570 and here the percentage of anacidity was 14·5. The remaining patients suffered from organic disease other than that of the stomach. The percentages of those with anacidity varied from 15·8 to 22·4. In their discussion on this part of their work Dr. Keefer and Dr. Bloomfield conclude that, while it is true that gastric acidity may disappear during the course of an acute illness, the assumption is not justified from such an observation that the gastric glands are incapable of secreting acid at that time. The indication merely is that after an Ewald test meal not enough acid is secreted to give the reaction of free hydrochloric acid.

In the second part of their communication Dr. Keefer and Dr. Bloomfield describe observations made in twenty-four cases of gastric anacidity. The diagnosis was made in each instance on the absence of free hydrochloric acid from the gastric contents when tested by dimethyl-amido-azo-benzol one hour after the standard Ewald meal. An attempt was also made to determine by clinical means the presence or absence of gross stomach disease independently of the results of gastric analysis. When dimethyl-amido-azo-benzol is used as an indicator it changes from orange to red at approximately pH 3·0 and serves as a reagent for titrating acidity below this point. It gives no information as to the reactions within the zone extending from pH 3·0 to neutrality at pH 7·0 or beyond on the alkaline side. For this reason Dr. Keefer and Dr. Bloomfield assumed and found it to be a fact that a stomach which did not secrete enough acid to give the mixed gastric contents a pH of 3·0 or lower, is not necessarily incapable of secreting hydrochloric acid. They point out, too, that an appreciable amount of hydrochloric acid is neutralized by the buffers of the test meal and of the gastric mucus and that a pH of 7·0 or above may be found even when acid has been secreted. It is strange that in this connexion they make no reference to the duodenal reflux and its neutralizing influence on gastric acidity. In fact no reference to this phenomenon will be found in their communication.

It has been shown that when histamine is injected subcutaneously, it is a powerful stimulant to gastric secretion. Histamine was injected by Dr. Keefer and Dr. Bloomfield into eight patients regarded as suffering from "functional" anacidity. In six of the number free acid was found. There was no response in the case of four patients suffering from definite organic disease of the stomach.

When this work is considered it will be seen that it is doubtful whether Dr. Keefer and Dr. Bloomfield have advanced knowledge to any great extent. They have certainly shown that many persons with apparent anacidity are actually able to secrete acid. No one with a clear conception of the digestive process would doubt this fact. The acid is necessarily mixed with the food ingested and with a certain amount of mucus. These together with the fluid from the duodenum will diminish the acidity. If the amount of acid secreted is not sufficient to bring the hydrogen ion concentration below pH 7·0, a clinical achlorhydria will result. The adoption of determination of the hydrogen ion concentration of the gastric contents either without or after the injection of histamine, as recommended by Dr. Keefer and Dr. Bloomfield, will unquestionably yield useful information. At the same time attention should be drawn to the fact that these workers have used the single Ewald test meal throughout their investigations. For practical purposes this has been all but abandoned in favour of the fractional method of examination. It has been shown beyond all doubt that the fractional method will yield more accurate information as to the state of the gastric function.

MELANOSIS AND CANCER OF THE BOWEL.

MELANOSIS is occasionally found in the mucous membrane of the colon extending from the ileo-caecal valve to the anus. Virchow drew attention to this condition in 1847 and cases have since been described by various observers. Bland-Sutton has pointed out that the pigmentation does not always extend throughout the colon. He referred to the colouration as a curiosity, devoid of any sinister significance and described the microscopical features of a cancer that arose in the pigmented colic mucous membrane of a septuagenarian spinster. The cells of the cancer were devoid of pigment and there was nothing to distinguish it from cancer arising in the non-pigmented mucous membrane. Dr. Miles F. Porter has recently reported a somewhat similar case occurring in a man, aged sixty-two years.[1] A tumour, about the size of a pullet's egg, was found in the lower end of the ileum and "general ink-black melanosis of the mucosa of the caecum" was present. The mucosa of the ileum appeared to be normal. The tumour was a "gelatinous adeno-carcinoma." The cut surface of the tumour was not pigmented.

The occurrence of cases of this kind raises the question of the origin and significance of melanin deposits. The practical point to be remembered is that the presence of a melanin in an abnormal situation does not always mean that melanotic sarcoma is also present. Ewing in a letter to Dr. Porter stated that melanosis is due to chronic stasis. He also suggested that the pigment is derived from some specific bacterial infection. Others have regarded the pigment as having an hæmatogenous origin. The majority of observers look on the pigment of a melanoma, however, as the product of some special metabolic function of the cell. This view was emphasized by Haden and Orr in describing melanuria in the absence of melanotic tumour. They regarded this as indicating a certain type of protein destruction and pointed out that it always occurred subsequent to a fall in the chloride content of the blood.[2]

[1] *Surgery, Gynecology and Obstetrics*, December, 1926.
[2] THE MEDICAL JOURNAL OF AUSTRALIA, June 7, 1924.

Abstracts from Current Medical Literature.

OPHTHALMOLOGY.

Suspension of the Fusion Impulse as a Therapeutic Measure.

E. M. ALGER (*Archives of Ophthalmology*, September, 1926) questions whether the importance of binocular single vision has been exaggerated and believes that in some patients it is maintained at too high a sacrifice. He has been impressed by the relief obtained in occasional cases by a frank abandonment of attempts to maintain binocular vision. It is perhaps fortunate that fusion can seldom be reestablished in strabismus patients and the author is becoming more satisfied with purely cosmetic results. In certain cases it is a useful therapeutic measure to suppress the fusion impulse, such as in anisometropia, incomplete motor paralysis, insufficiency of convergence, motor spasm and after removal of cataract from both eyes. Patients object to exclusion pads on cosmetic grounds. A "meshed" glass with a series of lines etched on one surface, a convex lens strong enough to blur vision and roughing the back surface of a lens with emery paper are useful expedients for blocking one eye. Presbyopic patients may wear distance correction over one eye and the reading correction over the other.

A Conjunctival Flap for Wound of the Cornea.

P. C. JAMESON (*Archives of Ophthalmology*, September, 1926) describes a new conjunctival flap for wounds of the cornea with prolapsed iris. A straight incision upwards starts from the centre of the upper corneal limbus and two curved incisions around the limbus are made, one on each side. The extent of the corneal incision depends on the situation of the wound. Two triangular flaps are then undermined. The apex of one flap is drawn over the cornea and sutured to the sclera where the opposite limbal incision terminates. The apex of the other flap is drawn over the cornea and fixed in the corresponding point of the opposite side. In the same article the author advocates the replacement of prolapsed iris in some cases by traction from within the anterior chamber through a corneal incision assisted by gentle pressure from without.

Rotated Island Graft Operation for Pterygium.

E. D. SPAETH (*American Journal of Ophthalmology*, September, 1926) describes a new method of dealing with severe forms of pterygium. The pterygium is separated from the globe by four incisions, except that a small area of subconjunctival tissue is left intact in the centre. The pterygium then forms a graft and is rotated inwards 90°. Each corner of the quadrilateral graft is sutured to the bulbar conjunctiva at the next angle in the rotation. The head of the pterygium is then turned upwards and the base downwards. The following is the technique. A stout silk suture is passed under the head of the pterygium and by means of this it is torn off the cornea. A vertical incision is made tangential to the cornea. Suture *A* is passed through the conjunctiva above and the lower corner of the pterygium. An upper horizontal incision is made clear on the pterygium and suture *I* is passed through the upper inner angle of the bulbar conjunctiva and the upper outer corner of the pterygium. The inner vertical incision is then made and suture *C* takes up the upper inner corner of the pterygium and the lower inner angle of the bulbar conjunctiva. The lower horizontal incision is then made and the sutures are tied.

The Ocular Circulation.

W. S. DUKE-ELDER (*British Journal of Ophthalmology*, October, 1926) briefly describes the ocular blood supply. The anterior and posterior ciliary arteries anastomose freely to form the uveal circulation, while the central artery of the retina is anatomically apart. At the same time there is abundant evidence to show that in the two systems the pressures are similar. The retinal arterial pulse does not differ from that of other arteries, but it is reduced beyond visible limits by the incompressible ocular contents and poor elasticity of the sclera. Even so it is visible in 36% and if magnified by the lever of a tonometer is always seen in the normal eye. When the intraocular pressure is raised, the pulsation becomes larger until the diastolic pressure is reached and the pulsation is at a maximum. On further pressure the pulsation diminishes until, when the systolic pressure is overcome, the blood flow ceases. But the pressure thus registered is not that of the ocular vessels at all, but of the ophthalmic artery, just as pressure over the brachial registers the pressure in the subclavian artery. Bailliart and Magitat have fallen into this error in addition to other fallacies depending on the construction of their dynamometer. The pressure in the branches of the retinal artery of cats was measured directly by the insertion into their lumen of a micropipette under the guidance of the ophthalmoscope. The micropipette was connected to a mercury manometer. An average for five animals gives a diastolic arterial pressure of 64 and a systolic pressure of 88 millimetres. Experiments to eliminate pressure in the ophthalmic artery revealed a diastolic pressure of 78 and a systolic pressure of 120 millimetres. In regard to venous pressure, the blockage of a vortex vein involves the production of hyperæmia and disturbance of the normal pressure equilibrium. The author experimented on dogs by a modified micropipette method; the relation of the intraocular pressure to the venous pressure in the eye was determined by the establishment of a fistula between a vein on the optic disc and the orbital contents. A needle guided by the ophthalmoscope is made to pierce a vein, when a fine jet of blood flows out into the vitreous. Hence the venous pressure is higher than the intraocular pressure. No one has yet devised a method to measure the capillary pressure in the eye. Though often stated to be the case, the capillary pressure has nothing to do with the diastolic arterial pressure. The "tissue pressure" in the eye which is the intraocular tension, is 20 to 25 millimetres, instead of one to two millimetres for the rest of the body, so the capillary pressure in this organ will be higher proportionately than in any other organ in a state of rest. It is probable that the pressure may be in the region of 50 to 55 millimetres and may fall to little above the intraocular pressure. These vascular pressures and their relation to the intraocular pressure are compatible with the view of the formation of the aqueous humour by a process of dialysis from the blood and do not necessitate the postulation of any "secretory" energy.

LARYNGOLOGY AND OTOLOGY.

The Counter-Rolling of the Human Eye.

C. E. BENJAMINS (*Journal of Laryngology and Otology*, May, 1926) describes his technique for measuring the counter-rolling of the human eye. Although this procedure is the only method by which otolithic function can be measured in an objective way, routine adoption by specialists has not taken place owing to the difficulty of examinations by previous methods. The author, with the help of his assistant, J. C. Müller, has now evolved a method which makes examination easy. First two little marks are painted on the cornea. The paint formula, its manufacture and application are fully explained. A firmly fixed, specially constructed spectacle frame is used, the second eye being covered. This frame is described in great detail. The measurements are taken with a special measuring tube. Examinations are carried out three times and an average is taken. The author will publish his results by this method at a later date.

Middle Ear Suppuration in Children.

DOUGLAS GUTHRIE (*Journal of Laryngology and Otology*, May, 1926) discusses the prognosis of middle ear suppuration in children. He tabulates results both immediate and subsequent which have been ascertained in a series of four hundred and ninety-five patients treated at the Royal Infirmary for Sick Children, Edinburgh, from 1920 to 1923. The common cold is the usual cause and a coryza in the young should be regarded seriously till cured. In addition to the typical cases

the author considers that there is a definite type of latent otitis met with in obviously sick children who have no symptoms or signs in any organs. In those children *otitis media* should always be suspected and a paracentesis of the drum performed to exclude a hidden middle ear focus. In acute *otitis media* the prognosis is usually good, 75% of the patients traced had neither discharge nor deafness. Chronic *otitis media* (in the author's classification, otorrhœa of over one year's duration) did not give such good results, 57% of patients traceable could be regarded as cured. Fifty-seven patients had a mastoid operation performed and in these the Schwartz operation gave the best results. Radical operation was disappointing in results, as was also the modified radical operation. The author's present opinion is that a thorough cortical operation together with efficient treatment of the postnasal space gives the best results. His conclusions are: (i.) The earlier *otitis media* is discovered and treated, the better the prognosis. (ii.) Avoidance of colds in infancy is all important. (iii.) Children should be instructed in nasal hygiene at an early age. (iv.) Dental, faucial and postnasal sepsis should be detected and treated and followed by breathing exercises and subsequent observation, until normality of the ears, nose and throat is assured.

Paths of Infection to the Brain, Meninges and Venous Blood Sinuses.

A. LOGAN TURNER AND F. ESMOND REYNOLDS (*Journal of Laryngology and Otology*, July, 1926) describe the history and *post mortem* findings in the second case in their series of intracranial infections from peripheral inflammatory foci. The patient, a female, aged twenty-six years, was admitted to the Edinburgh Royal Infirmary suffering from a right subperiosteal orbital abscess, cavernous sinus thrombosis and basal meningitis. Death occurred in three days. Affected parts were subjected to close investigation after *post mortem* removal. The findings are given in great detail, with illustrations. The authors conclude that the original focus was a chronic infection of the post ethmoidal and sphenoidal sinuses on the right side. Infection had spread to the bony structures of the sinuses, causing the subperiosteal abscess and also by the diploic veins to the cavernous sinus. From this sinus the infection spread by septic thrombi to the tributary veins of the orbit (retrograde), *dura mater* and *pia mater*. The authors regret that there are no records in other clinics to help the formation of an opinion as to the incidence of intracranial complications of nasal sinusitis. At the Edinburgh Royal Infirmary during the period of 1907 to 1921 inclusive, 866 cases of suppurative sinus disease were diagnosed and of these six were characterized by intracranial complications, a percentage of 0·6. A similar investigation in cases of aural suppuration showed that intracranial lesions occurred in 201 amongst 8,864 cases, a percentage of 2·2. Two sources of error in these statistics should be borne in mind, namely, first that in a number of instances nasal sinusitis is not diagnosed, second, that patients dying of meningitis *et cetera* have often not had a nasal investigation. Study of available literature showed that of the individual sinuses, intracranial complications were due to the frontal sinus in 61%, the sphenoidal sinus in 17%, the ethmoidal cells in 14% and the maxillary antra in 3%.

Tonsillectomy in Children.

ALBERT D. KAISER (*The Journal of the American Medical Association*, September 25, 1926) discusses tonsillectomy in children. Five years ago eighteen thousand children had been recommended for tonsillectomy by school medical officers and of these eight thousand were submitted to operation. All these patients had had symptoms indicating necessity for operation. The symptoms considered indicatory were one or more of the following: mouth breathing, enlarged cervical glands, frequent sore throats, frequent head colds, malnutrition without other apparent cause, ear disease, frequent pyrexial attacks without other causes, joint pains. A year after operation five thousand of these were reexamined and three years later twelve hundred patients operated on and twelve hundred who had refused operation, were again examined and the incidences of their previous symptoms noted. The author has indicated these findings clearly in a graph. His conclusions are that all the symptoms previously mentioned as indications, are definitely relieved by operation. The incidence of respiratory diseases is not influenced by operation. Scarlet fever and diphtheria occurred less frequently in patients operated upon and operation may be considered a prophylactic measure against these diseases. The presence of positive or suspected evidence of rheumatic syndrome is a clear indication for operation. Finally, the author emphasizes the advisability of admission to hospital for this operation.

Hæmatoma of the Soft Tissues of the Throat.

LE ROI A. SCHALL (*The Laryngoscope*, September, 1926) reports a case in which a large hæmatoma of the tonsillar area occurred after the operation of tonsillectomy. The operation was performed under local anæsthesia on a male, aged twenty-nine years, whose coagulation test time prior to operation yielded a normal result. Hæmorrhage from the left tonsillar fossa commenced two hours after operation and as it continued a general anæsthetic was given half an hour later. During induction with gas, asphyxia occurred and a tracheotomy was immediately performed. Examination of the throat when respiration was reestablished, revealed a hæmatoma of the soft palate and adjacent areas completely filling the oro-pharynx. Aspiration of the hæmatoma was attempted without result. Two cubic centimetres of "Thromboplastin" were given intravenously and the tracheotomy tube was left *in situ*. Recovery was rapid, the hæmatoma quickly subsided and the tracheotomy tube was removed two days later.

Hæmorrhagic Types of Ear Disease Occurring During Epidemics of Influenza.

WILLIAM MILLIGAN (*Journal of Laryngology and Otology*, August, 1926) discusses the virulent hæmorrhagic type of ear infection which occurs during epidemics of influenza. These cases are characterized by the sudden onset and the rapid destructive process exerted by the infecting organism. The appearances of an infected ear are in the author's opinion sufficient evidence to warrant a diagnosis of influenza. The external auditory meatus manifests an *otitis hæmorrhagica* in which purple bullæ containing blood appear in the drum membrane and the meatal walls. These bullæ tend to rupture spontaneously, but when noted should be punctured and the ear should be dressed with sterile gauze packing. This external otitis is frequently complicated by an acute *otitis media* and the drum membrane is noticed to be bulging as well as being infected by bullæ. Immediate wide paracentesis is indicated, as, if left to spontaneous rupture, there is great destruction of tissue. It has been noted that paracentesis does not immediately relieve the aural pain, as is usual in cases of ordinary acute *otitis media*. The infecting organism is the influenza bacillus which immediately makes way for the streptococcus, so quickly in fact that it is only at the onset of the disease that the influenza bacilli can be detached. Rapid extension of the disease to the area of the mastoid antrum is typical of this infection and shows a predilection to an apical mastoid abscess. Bone destruction is rapid and extensive and the author has had frequent experience of cases in which the whole posterior mastoid wall has been destroyed leaving an extensive area of cerebellar *dura mater* exposed. These patients suffered with severe headaches, with unduly high temperature and depressed mental state, which indicates a concomitant serous meningitis. This being the case, a lumbar puncture should be done at once and repeated if necessary. This routine has been found to relieve symptoms and to give the best results. A number of these patients also have the internal ear affected, but this state is masked at the time by the middle ear symptoms. The lesion is a hæmorrhagic effusion into the cochlea together with a toxic infection of the auditory nerve. As this lesion results later in a definite and progressive nerve deafness, early recognition of the labyrinthine involvement is essential and vigorous treatment should be directed to it by local depletion, lumbar puncture and subcutaneous injections of pilocarpine.

British Medical Association News.

SCIENTIFIC.

A MEETING OF THE OBSTETRICAL AND GYNÆCOLOGICAL SECTION OF THE VICTORIAN BRANCH OF THE BRITISH MEDICAL ASSOCIATION was held on October 29, 1926.

STANDARDIZATION OF OBSTETRICAL TREATMENT.

The meeting was opened by Dr. Tate Sutherland, Chairman of the Honorary Staff of the Women's Hospital. He pointed out that the report to be read was really a critical analysis of the results of treatment of the patients attended at the Women's Hospital from July 1, 1925, to June 30, 1926. He drew special attention to the following points in the report:

(i.) The very large number of patients confined at the Hospital.
(ii.) The very small maternal mortality among patients who had come from the antenatal clinic.
(iii.) The small percentage of perineal lacerations occurring in the conservative treatment of normal labour.
(iv.) The good results of conservative after treatment.
(v.) The good results of the conservative treatment of eclampsia.
(vi.) The dangers of Cæsarean section in infected patients.

A report was read on the standardization of obstetrical treatment. It had been drawn up by Dr. A. M. Wilson, D.S.O., Lecturer in Obstetrics and Gynæcology, Melbourne University, Dr. John S. Green, Demonstrator in Obstetrics, Melbourne University, Dr. Hubert Jacobs, Demonstrator in Obstetrics, Melbourne University, and Dr. W. Ivon Hayes, Clinical Assistant to the Gynæcologist, Melbourne Hospital. The substance of the report is as follows:

Introduction.

During the year July 1, 1925, to June 30, 1926, 2,680 women were delivered at the Women's Hospital, that is approximately 7·4% of all confinements occurring in the State of Victoria during the period; 896 were *primigravidæ* (8·16% of all *primigravidæ* in the State); 1,784 were *multigravidæ*. Of the total patients delivered 1,281 came from our own antenatal clinics and in this series there were two maternal deaths and 60 dead births and neonatal deaths (4·7%). One thousand three hundred and ninety-nine were admitted as emergency cases and in this series there were 26 maternal deaths and 97 dead births and neonatal deaths (7%).

The emergency cases could be divided into two classes:

(i.) Women in normal labor who had not previously attended an antenatal clinic.
(ii.) Women who claimed admission or who had been referred to the hospital by outside practitioners and who were suffering from some disorder of pregnancy or labour.

As many patients with abnormal conditions were referred to our antenatal clinics and as the proportion of abnormal conditions was unduly high in the emergency cases, it is more than probable that whilst 7·4% of all pregnant women in the State were delivered at the hospital, at least 10% of all women with abnormal conditions in the State were attended there. Thus the amount of clinical material for purposes of investigation is very great.

During the year the Honorary Obstetrical Staff, together with the Superintendent and the Senior Resident Medical Officer, met regularly every month and discussed the work done during the previous month. All abnormal cases and the methods of treatment were fully and frankly discussed. All the maternal deaths were thoroughly investigated, the *post mortem* findings were considered and suggestions were made for alternative methods of treatment.

As a result of much discussion we have evolved what is practically a standard routine and it is this standardization of treatment which we desire to present to you this evening. The subjects of each speaker have been chosen quite indiscriminately, but we all accept the responsibility of each other's remarks. As practically the whole range of obstetrics will be covered, our remarks will necessarily be brief.

In addition to those of the profession, concerned about the teaching of students, we hope that our remarks will be of double interest, because the methods of treatment we present are those actually taught to the students at the University lectures and demonstrations and at the Women's Hospital and also we believe that with but minor adjustments these methods are applicable to the routine work of private practice.

The Antenatal Clinic.

Of the 2,680 patients confined at the Hospital, 1,281 or 47·8% had attended the antenatal clinic. Two maternal deaths occurred in this series. One woman attended the antenatal clinic once, four months prior to delivery and a diagnosis of contracted pelvis was made. She returned at full time with an obstructed labour and unfortunately died of infection after a Cæsarean section. The other woman was admitted with a toxæmia of pregnancy (with albuminuria), had a premature labour at seven months and died apparently of shock after a manual removal of an adherent placenta.

Amongst the antenatal patients there were noted the following complications:

Eclampsia occurred in eight cases. In six the condition was mild and in two it was severe. No maternal deaths occurred. There were seven living children, but one died after twelve hours. All these cases occurred in patients who had been irregular in their attendance. Nevertheless we admit this figure as being far too high and it illustrates the need for a very close watch to be kept on all patients and also the necessity of writing to patients who are irregular in their attendance.

A diagnosis of contracted pelvis was made in twenty-nine cases and the patients were treated. Excluding the patient previously mentioned as she had no antenatal treatment whatsoever, there were no maternal deaths and two fœtal deaths. Nineteen Cæsarean sections were performed, nine being repeated operations. Of the ten patients operated on for the first time, four were given a trial of labour. In five cases labour was induced. Of the ten patients delivered *per vias naturales* seven had spontaneous delivery, two required forceps and one required a craniotomy. The other fœtal death occurred in a forceps delivery.

Placenta prævia occurred three times with no maternal deaths, but two fœtuses were born dead.

Accidental hæmorrhage occurred eleven times, six of the patients were definitely toxæmic, having definite albuminuria. There were no maternal deaths, but six dead born fœtuses.

Thirty patients with albuminuria were admitted from the clinic.

Seven patients with proved pyelitis were admitted (twenty-one emergency admissions also occurred during the year).

Only two patients were admitted with *hyperemesis gravidarum* from our clinic whilst thirty-one were admitted as emergency cases.

The administration of the antenatal clinic is as follows:

An inquiry is made into the constitutional condition of the patient and also into any previous obstetric complications.

The expected date of parturition is estimated and care is taken to prevent postmaturity. External pelvimetry is performed on all *primigravidæ* and in *multigravidæ* with a history of previous dystochia. A pelvic examination is made and the diagonal conjugate estimated. If any abnormality is noted, a red tab is placed on the patient's antenatal card.

We place less reliance now on internal pelvimetry and gain more valuable information from: (i.) Personal opinion as to size and shape of the pelvis by vaginal examination; (ii.) Müller's and Munro Kerr's tests with general anæsthesia if necessary; (iii.) engagement of the fœtal head in *primigravidæ* during the last weeks of pregnancy.

We lay stress particularly on the value of abdominal palpation of all patients six to four weeks before the expected date. All patients are given an antenatal card of instructions and on each card is written the dates on which they are to attend for their final examinations. The Wassermann test is not done as a routine owing to laboratory difficulties. Those with albuminuria, if mild, are treated as out-patients, if their condition is severe they are admitted.

Patients suffering from *ante partum* hæmorrhage are practically always admitted for investigation.

Breech presentations are always corrected about the thirty-fourth to the thirty-sixth week and the patients are carefully watched afterwards.

The Management of Normal Labour.

We believe that the keynote of successful treatment in the normal case is the policy of masterly inactivity, combined with watchful expectancy. Of the 2,648 women delivered *per vias naturales*, 2,459 had vertex presentations, a percentage of 92·5.

Of the 2,459 patients with vertex presentations 223 were delivered with forceps but of these 103 vertex presentations were "made" cases (head on perineum). It will thus be seen that only 120 women actually needed help, that is, 4·9%.

The students are taught that the woman in normal labour is far better off and far safer if she has no doctor at all than if she has one that interferes unnecessarily. The woman whose presentation is normal is delivered in the left lateral position and we have found by a statistical survey that a simple iodine preparation after shaving is followed by less morbidity than the more vigorous preparations associated with much scrubbing with "Lysol" or biniodide of mercury.

The first and second stages of labour are conducted according to the ordinary principles of obstetrics. The correct management of the third stage is insisted upon. As soon as the head is born, a hand is placed on the fundus and is kept there until the placenta has been expelled and the uterus is tightly and firmly contracted and all hæmorrhage has ceased.

Time is always allowed for the uterus to expel the placenta into the vagina by its own efforts. The hand, whilst waiting, merely rests on the fundus without massaging it for the first twenty minutes after the expulsion of the fœtus.

After this gentle stimulation of the uterus may be adopted. Crédé's method of expression of the placenta from the uterus is not attempted for at least one hour after the birth unless hæmorrhage is occurring. If the placenta is still retained, Crédé's method is tried again three or four times within the next hour. If still retained Crédé's method is tried under anæsthesia. This is usually successful. If unsuccessful, the placenta will probably need later to be manually removed.

With the correct management of the third stage of labour *post partum* hæmorrhage should be very rare.

During the year 32 patients lost more than normally, but none of them required any special treatment. The placenta was manually removed twenty-three times (1 in 116 cases). This figure seems unduly high and special attention will be directed to this subject next year.

All perineums were carefully inspected and sutures are always inserted if necessary. During the year 332 perineums required suturing (1 in 8 of all cases); 230 in *primigravidæ* (1 in 4 but if breeches be excluded 1 in 6); 102 in *multigravidæ* (1 in 18). There were only five complete tears, one of which occurred before the patient was admitted to hospital. These figures compare very favourably with those obtained in private practice by most practitioners and speak volumes for the policy of non-interference.

The indications for the use of forceps are:

(i.) Impending or actual maternal distress.
(ii.) Impending or actual fœtal distress.
(iii.) Delay in the second stage of labour.

The necessary conditions which should be present in all cases unless some grave obstetrical emergency is present are:

(i.) A favourable position and presentation: (*a*) Vertex with occiput toward the front; (*b*) face with chin toward front; (*c*) after-coming head in a breech with the occiput toward the front.
(ii.) Cervix should be fully dilated and what is most important, the cervix should be pulled up over the fœtal head which is thus completely in the vagina.
(iii.) Membranes should be ruptured.
(iv.) Absence of secondary uterine inertia is essential.
(v.) Bladder and rectum should be empty.
(vi.) The maximum diameter of the head should be past the brim.
(vii.) No insuperable obstruction should be present.

We recommend cephalic application of the forceps and think that the modes of action should be limited to traction, a very small amount of rotation and guidance of the head over the perineum.

Forceps were used in 223 cases or 9% of all vertex presentations and 8·3% of all deliveries, but only 4·9% actually needed help as 103 were "made" cases.

The types of operation were:

(i.) High in one, a *multigravidæ* with no disproportion but the head arrested at the brim by a prolapsed arm.
(ii.) Middle and low in 119 of which about 60% were low.
(iii.) Head-on-perineum in 103.

The chief indications for the middle and low operations were delay in the second stage of labour in sixty cases (50%) and persistent occipito-posterior presentation in thirty cases (25%).

We believe that delay in the second stage of labour is one of the most frequent causes of dead birth and insist that the fœtal heart should be carefully auscultated at intervals during the second stage of labour.

The "head-on-perineum" operation is used to designate those cases of forceps operations in which the maximum diameter of the head is out of the bony pelvis and the head is bulging the perineum. Whilst admitting that forceps will need to be used more frequently in private than in hospital practice owing to the insistence of the patient and her relatives that her sufferings should be ended, yet we still strongly maintain that this should be the commonest type of operation performed in private practice. We teach the students that to think they can save perineums by forceps operations, other than the head-on-perineum type, is hopeless optimism and also we teach that this is the only forceps operation that is almost devoid of risk to the mother and fœtus.

Of the 2,459 vertex presentations, 64 were classified as persistent-occipito-posterior. Thirty-four of the patients delivered themselves spontaneously (practically all *multigravidæ*). The remaining 30 required forceps.

It is commonly accepted that in 25% of all vertex presentations prior to the onset of labour the occiput is posterior. Assuming this figure to be correct, of the vertex presentations that occurred, 615 were posterior at the onset of labour yet only in 64 (approximately one in ten) did the occiput fail to rotate to the front. These figures agree with our teaching in regard to posterior positions which is that nine out of ten will rotate to the front if the obstetrician exercises enough patience and that practically all of the rotation occurs during the second stage of labour and consequently a longer time must always be allowed in the second stage for this forward rotation to occur.

Toxæmias Including Eclampsia.

Eclampsia.

The term eclampsia is reserved for patients actually taking fits.

Thirty-eight patients with eclampsia were admitted. One was delivered of twins. In the series there were three maternal deaths—one died within a few minutes of admission, one within an hour and one within four hours. All these mothers died undelivered. Of the thirty-nine fœtuses three were not born. Of the remaining thirty-six twenty-nine were born alive, but of these four died during the puerperium. Thus the maternal mortality was 7·7% and

the corrected fœtal mortality 28%. The three patients referred to were all practically moribund on admission, so the result of our treatment has been very satisfactory.

Twenty-one cases were *ante partum* (55%), nine were *intra partum* (24%) and eight were *post partum* (21%).

According to Eden's classification of severity twenty-seven cases were mild and eleven severe and all the deaths occurred amongst the severe forms. Eden classifies a case as being severe if any two of the following six signs are present: Deep coma, more than ten fits, a pulse rate over 120, a temperature over 39·4° C. (103° F.), blood pressure over 200 millimetres of mercury, urine which becomes solid on boiling.

Twenty-one patients out of thirty-eight were *primigravidæ* (55%). In each fatal case there was strong evidence of chronic nephritis, the eclampsia being superimposed. In regard to the treatment of the pregnancy of the thirty-eight patients, three died undelivered, three had labour induced. Of the thirty-five deliveries twenty-one were spontaneous, fourteen required forceps.

Our treatment of eclampsia with but minor exceptions is standardized according to the following principles: (i.) Elimination; (ii.) starvation; (iii.) non-radical interference with pregnancy and labour.

We insist on the immediate commencement and the strict maintenance of treatment. Postural treatment is important, the patient being placed in the left lateral position with her head low in order to keep the air way clear. Eliminative measures adopted are free purgation *viâ* the stomach with compound mixture of senna, sulphate of magnesia or compound of jalap. If the patient is unconscious, a stomach washout may be given and the purgatives left behind; free colonic lavage with large quantities of water may be used and an aperient left behind at the finish. The colonic lavage may be repeated in four to six hours. Hot packs and poultices to the loins may be used.

Starvation is insisted on, the patient being allowed water only for twenty-four to forty-eight hours according to her condition.

Various other treatments are used.

We are not all agreed as to the exact value of morphine, but we are all agreed that the administration of large doses, as was formerly the practice, is harmful. It is of great value when the patient is very restless, especially when labour commences.

Atropine is of value when respiration is embarrassed owing to the great secretion of mucus. Oxygen is also given for cyanosis after the fits.

Chloral, potassium bromide and paraldehyde are sometimes given *per rectum*. Venesection has been done for patients with a very high blood pressure. "Veratrone" has not been used nor has lumbar puncture.

The following are regarded as favourable signs: (i.) Cessation of fits; (ii.) spontaneous bowel action; (iii.) return to consciousness; (iv.) onset or completion of labour.

Unfavourable signs are: (i.) Rapid recurrence of fits; (ii.) deepening of coma; (iii.) no bowel actions; (iv.) rising temperature and pulse rate; (v.) absence of uterine action; (vi.) cerebral complications; (vii.) jaundice; (viii.) anuria; (ix.) inability to sweat.

Following the cessation of the convulsions, elimination and starvation are continued.

If the pregnancy is uninterrupted, treatment similar to that adopted for albuminuria of pregnancy is adopted. That is labour is induced or pregnancy is allowed to continue according as there is no response or good response to treatment.

Preeclamptic Toxæmia.

Treatment of preeclamptic toxæmia is commenced without delay and is continued without relaxation should labour commence. The following signs and symptoms give indications that the labour should be induced:

(i.) Rising blood pressure; (ii.) increased albuminuria; (iii.) increasing œdema with lessened urinary output; (iv.) a daily maximum urea concentration of less than 1·5%; (v.) blood urea of 50 milligrammes per one hundred cubic centimetres or greater; (vi.) jaundice; (vii.) persistent vomiting or epigastric pain; (viii.) ocular symptoms and signs.

Hyperemesis Gravidarum.

Treatment for *hyperemesis gravidarum* is almost always conservative as nearly all patients manifest a large element of neurosis especially at the commencement, though we admit that later a profound toxæmia and acidosis may be superimposed and will eventually lead to the death of the patient, if untreated. Our principles of treatment are ordinary therapeutic measures, psychotherapy, carbohydrate replacement (solutions of sodium bicarbonate and glucose either by mouth or *per rectum*). Therapeutic abortion was necessary in only two cases out of thirty-eight. One patient, admitted in a desperate condition after three months of treatment, died after an induction.

After Treatment.

The after treatment results have been very interesting. The morbidity rate for the whole year was 9%. We gave this matter our very careful attention and decided to make various minor alterations in the hospital routine, including the omission of scrubbing of the genitalia with biniodide or "Lysol" and the substitution of a simple iodine preparation after shaving. Since the adoption of these measures during the last five months the morbidity has fallen to 7·1% and since the conclusion of this report it has dropped even lower. We believe that it could be made even lower by the omission of vaginal examinations made by the students and nurses, though if this were done we feel that it would diminish the value of their training.

In regard to the treatment we pursue a policy of absolute non-interference with the uterine cavity. No douches (also no vaginal douches) no curettage or curage or explorations are used. We admit only one indication for intrauterine interference during the puerperuim, that is, persistent hæmorrhage.

Every patient has the head of the bed elevated for the first four to five days and after that the patient is encouraged to sit up in bed.

For febrile patients our lines of treatment are as follows: (i.) General supportive treatment of the patient; (ii.) ensurement of drainage by postural treatment: (iii.) promotion of contraction of the uterus by massage and ergot.

However, we believe that improper massage is a potent cause of retroversion of the uterus after child-birth.

With this treatment no patient died in the after treatment wards except the three patients who were previously infected. Ten patients were transferred to the isolation ward in the gynæcological block. Of these five suffered from suppurative mastitis; two from pelvic cellulitis, two from severe uterine infections and one from pelvic peritonitis.

With continued conservative treatment, there were no deaths amongst these patients.

Of 159 "morbid" cases carefully investigated during the last eight months, in 62 (or 39%) the rise in temperature lasted only two days, in 60 (or 38%) it lasted from three to five days, in 37 (or 23%) the rise in temperature lasted over five days. Of these 159 cases 65 (42%) were due to infection, 23 cases (15%) were due to pyelitis and 23 (15%) were due to mastitis.

All patients are examined *per vaginam* before discharge and a note of any gynæcological lesion is kept. All patients are given a card and instructed to report to the post-natal clinic.

Ophthalmia neonatorum.

During the early part of the year "Protargol" (10%) was used as a prophylactic for ophthalmia. A few cases occurred. We then decided to use a 1% solution of silver nitrate and since then there have been no cases.

Abnormal Labours.

Of the 2,680 cases under review, 427 were abnormal (16%), though if the "made" forceps cases be excluded the total falls to 324 (12%).

The abnormal cases were: Forceps deliveries 223, including 103 "made" cases; persistent occipito-posterior presenta-

tions 64 (30 of these are included in the group of forceps deliveries); face presentations numbered 5; brow presentations 2; breech presentations (excluding versions) 101; transverse lies 9; twins 21; Cæsarean sections 31; ruptured uterus 2.

Forceps.

The indications for forceps treatment have already been discussed.

Persistent Occipito-Posterior Presentations.

Our expectant treatment for persistent occipito-posterior presentations has already been discussed. If after the patient has been in the second stage one or two hours, there is no descent of the head and if there is no forward rotation occurring, we believe that interference is necessary. Of course if there are signs of fœtal or maternal distress, interference may be necessary earlier. We think that manual rotation of the occiput is preferable to rotation by forceps and in many cases the hand has to be slipped past the fœtal head and the anterior shoulder rotated also.

Face Presentations.

The five face presentations included two anencephalic fœtuses. Of the others two were mento-anterior, one mento-posterior. We always adopt conservative treatment in these cases, but insure forward rotation of the chin. All patients did well.

Brow Presentations.

Of the two brow presentations one was corrected to a vertex, the other to a face. Both mothers and infants did well.

Breech Presentations.

Of the 101 breech presentations we regret to note that about 30 came from our own antenatal clinic.

The following reasons are given: (i.) Some patients did not present themselves for their final examinations; (ii.) several cases recurred after correction; (iii.) one case defied correction.

All mothers did well, twenty fœtuses were dead-born, nine were macerated or premature, four had a prolapsed cord, four died from asphyxia in *primigravidæ* and three from the same cause in *multigravidæ*.

Of the 101 cases, 11 were footlings. Our routine treatment for arrest of the breech at the brim or in the cavity of the pelvis is to pull down the legs and we have frequently been surprised at the ease with which this can be done even when the breech has descended into the pelvis. When the breech is on the perineum, traction with the fingers in the groin is used. There is great risk of fœtal dead-birth if the breech is allowed to remain too long on the perineum. Here again we strongly recommend a policy of non-interference in dealing with breech presentations.

The Transverse Lie.

Transverse lies numbered nine. One mother died after a Cæsarean hysterectomy, after an attempt at vaginal delivery had failed. This patient had been in labour for nearly three days and was definitely infected. She had a very definite contraction ring and it was impossible to remove the child *per vaginam*, though an attempt was made. In the remaining eight cases a version was performed and the child extracted when the *os* was fully dilated or almost fully dilated. Three fœtuses had prolapsed cords. Only two infants out of eight survived. We all believe that a Cæsarean section is contraindicated in practically every transverse lie and prefer a version if possible, otherwise some destructive operation.

Trial of Labour.

In border line cases of disproportion between the maternal pelvis and the fœtal head, patients are always given a trial of labour. Unless the conditions for performing a Cæsarean section are absolute, we believe that all *primigravidæ* should be given a trial of labour before the operation is performed. We are all not quite agreed as to what constitutes a fair trial of labour.

The pains should be allowed to continue for some hours. As to whether the membranes should be artificially ruptured after say twelve to twenty-four hours of labour, we are not agreed. Nevertheless we are all agreed that the trial of labour is not complete until the patient has had four hours of labour after the membranes have ruptured and also we are agreed that the final decision must not be left later than this. We regard the prognosis as good if the following conditions are found: (i.) Non-rupture of the membranes until the *os* is at least nearly fully dilated; (ii.) head engaging in full flexion and descending; (iii.) cervix well "taken up" and spread round the head.

The prognosis is considered to be bad if these conditions are found: (i.) Premature rupture of the membranes; (ii.) head not descending and becoming extended, especially if previously flexed; (iii.) asynclitism developing especially if posterior; (iv.) no "taking up" of the cervix and especially if the vaginal portion of the cervix has reformed; (v.) over-riding of the fœtal head over the symphysis after the membranes have ruptured; (vi.) no descent of the anterior shoulder.

The greatest difficulty is with those cases in which the membranes rupture before or just after onset of the trial of labour. In these cases the obstetrician must make his decision within six to eight hours as unfortunate experiences have taught us the truth of the statement that the mortality of the Cæsarean operation is increased by 1% for each hour it is performed after the membranes have ruptured.

Antepartum Hæmorrhages.

Accidental Hæmorrhage.

Forty-one patients suffered from accidental hæmorrhage and nine of those were from our own antenatal clinic. All the mothers survived, 21 fœtuses were dead-born.

We divide these cases into two groups—idiopathic and toxæmic. We have so far separated them only by the absence or presence of albuminuria; in future renal efficiency tests will have to be performed. In many of the simple cases a history of trauma has been elicited. In the idiopathic cases the results have not been so severe either to the mother or fœtus as with the toxæmic cases.

Seventeen patients suffering from the idiopathic form without albuminuria were treated expectantly or with mild measures as pituitrin, binder *et cetera*, a vaginal plug being necessary only in one case. Six fœtuses were dead-born.

Twenty-four patients suffering from the toxæmic form with albuminuria were treated. Twenty-one were treated with pituitrin, binders, vaginal plugging. In this series two podalic versions were performed, once because a hand presented with the head and obstructed the labour and the other because this condition was complicated by a *placenta prævia*. Three patients with very severe accidental hæmorrhage were treated by Cæsarean hysterectomy. In the 24 toxæmic cases, all the mothers survived; of the fœtuses 15 were dead-born (six were macerated).

We have attempted to standardize the severity of cases of accidental hæmorrhage of the toxæmic type and have adopted provisionally the following criteria:

(i.) Dead fœtus *in utero*; (ii.) quarter albumin in the urine after boiling; (iii.) absence of uterine contractions; (iv.) temperature of 36·1° C. (97° F.) or under or a pulse of 132 or over.

We found it impossible to standardize any increase in size of the uterus. The condition of a patient having two of the above signs is regarded as severe and that of one having three of these signs as very severe. Of our cases four were very severe.

In regard to treatment it may be said that all patients with albuminuria during pregnancy should be treated and the urine should be examined in all cases of *ante partum* hæmorrhage. The treatment depends on the type, on the amount of bleeding and on the size of the *os* and in severe cases on the tone of the uterine muscle. Very mild cases need expectant treatment only; mild cases need tight binders, pituitrin and quinine, cases of moderate severity in addition will need vaginal plugging. In the very severe cases when the internal *os* is closed and when the uterine muscle has been so spoiled by the toxæmia that it is

paralysed, we have obtained very good results from Cæsarean hysterectomy.

Placenta Prævia.

Eleven cases of *placenta prævia* occurred and two of the patients were from our own antenatal clinic. One mother died, six fœtuses were dead-born. The treatment depends on the variety of *placenta prævia* (central, marginal or lateral) and on the size of the *os* and its dilatability. With small dilatation of the *os* and a central *placenta prævia* Cæsarean section should be considered when a living child is especially desired and if the pregnancy has extended for thirty-six weeks or over. It is doubtful if a Cæsarean section should be considered, if the pregnancy has not reached thirty-six weeks' duration. Whenever a Cæsarean section is contemplated, the mother should be in good condition and she and her relatives should be informed of the increased risk of the operation as compared with other methods of treatment.

In other cases if the *os* does not admit two fingers, the vagina is plugged and a tight binder applied. The plugs are removed in eight to twelve hours and if the conditions are favourable, a bipolar version is performed, one leg is withdrawn through the cervix and a gauge loop to which a weight is attached, is fastened to the leg and suspended over a pulley and the case is then left to Nature. The third stage must be managed very carefully, as it must always be remembered that the commonest cause of death in all cases of *ante partum* hæmorrhage is *post partum* hæmorrhage.

In other cases when the *os* is well dilated, rupture of the membranes may be sufficient to control the bleeding as in these cases the placenta is probably lying laterally.

We believe that the safest treatment and the treatment which is applicable to most cases, is a bipolar version without extraction of the fœtus.

Of the eleven patients under review one was treated by Cæsarean section, both mother and child survived and did well. Six were treated by podalic version, one mother died and five of the fœtuses were dead-born. Four were treated by vaginal plugging, rupture of the membranes, pituitrin and one required a forceps delivery—all of the mothers survived and one fœtus was dead-born (forceps case). The maternal death in this condition illustrates the danger of this condition. The mother had two or three hæmorrhages before admission, but was admitted in fair condition and her vagina had been tightly plugged. She had some strong labour pains and the packs were removed. The cervix was found to be fully dilated and completely covered by the placenta. As the fœtus was alive, it was thought justifiable to do a version and extraction. This was done and the fœtus was extracted alive, but the mother died two hours later apparently from the shock of delivery as she had no *post partum* hæmorrhage. The *post mortem* findings revealed no lacerations in the cervix or lower uterine segment.

Induction of Labour.

In reviewing our monthly reports, we were all struck by the comparatively great proportion of the large babies (over 3·6 kilograms or eight pounds) that were dead-born or died during the puerperium. We are all very strongly in agreement with prophylactic induction (Barrington) at full time.

With regard to the induction of premature labour for contracted pelvis in *primigravidæ* we prefer to let the pregnancy go to full time and give a trial of labour (owing to the high percentage of fœtal dead-birth and neonatal death after induction). In contracted pelves in *multigravidæ* we are strongly in favour of induction at the thirty-sixth week.

Labour is frequently induced in patients with toxæmias that are not responding to treatment and also in disorders associated with pregnancy especially chronic nephritis and failure of cardiac compensation.

The methods used were "Watson's" for prophylactic induction and also for some of the toxæmic cases (though some of us prefer to omit the pituitrin and to rely on the quinine, castor oil, hot bath and enema). The insertion of a rectal tube into the uterus (perhaps associated with a modified Watson's technique) was used in the other cases.

During the year nineteen inductions were performed by using a rectal tube. Eight of these were for toxæmia of pregnancy and chronic nephritis; all the mothers survived. In one case of chronic nephritis the child was not viable. One mother with toxæmia had twins, one of which died. All the other infants survived.

Eight were cases of contracted pelvis (one *primigravida* and seven *multigravidæ*). All infants and mothers survived.

One fœtus was post-mature. Both mother and infant survived.

One patient suffered from pulmonary tuberculosis with a similar result.

One patient suffered from cardiac failure. The mother survived, the fœtus was not viable.

Analysis of Cæsarean Sections.

During the year thirty-one Cæsarean sections were performed (1·1% of all deliveries). Twenty-six were for contracted pelvis and nine were "repeated" operations. Two cases of severe accidental hæmorrhage were followed by hysterectomy, both mothers survived, the fœtuses were dead-born of course. One patient had a central *placenta prævia*, the pregnancy had advanced practically to full time and the mother owing to the loss of other children was extremely anxious to have a live child (both mother and child survived). Two pregnancies were complicated by myomata of the uterus which caused obstruction to delivery and both Cæsarean sections were followed by hysterectomy (both mothers and infants survived).

Of the twenty-six patients with contracted pelvis nineteen came from our own antenatal clinic. Of these nine were "repeats", eight had either had previous inductions or had failed badly at a previous labour, two failed after a trial of labour. In this series of cases all the operations, except the two after the trial of labour, were performed before the membranes had ruptured. In these series there was no mortality either maternal or fœtal.

Of the remaining seven patients three were operated on after the membranes had ruptured, but not longer than twelve hours. All the mothers and children survived. Four were operated upon after the membranes had been ruptured over two days. All were cases of obstructed labour and all the patients were desperately ill. In two cases hysterectomy was performed. In this last series three of the mothers died and three children were still-born.

These results demonstrate that good results may be expected when section is performed before the onset of labour, when the operation is done before the membranes have ruptured and also after a properly conducted trial of labour. When the patient has been in labour for some time, the most important factor in prognosis is the time which has elapsed after the membranes have ruptured.

These cases of obstructed labour constitute our greatest source of worry and anxiety. Many of the patients have had repeated attempts at delivery and are often infected before admission. We strongly believe that these patients should be delivered *per vias naturales*, if necessary after some destructive operation, but on occasions we have considered this impossible and have been forced very much against our wishes to perform a Cæsarean section.

We would strongly emphasize the fact that every first full-time labour is really a "trial", that the signs and symptoms of failure of the trial should be recognized early and that if these symptoms and signs are present, the indication is not to attempt to deliver by a high forceps operation, unless the obstetrician is quite prepared to go on and deliver by other means if the forceps fail.

Analysis of Maternal Deaths.

During the year there were 3,925 patients admitted to the obstetric department, 2,680 were confined, 1,245 were suffering from complications of pregnancy and were not confined (that is miscarriages, intercurrent diseases and disorders of pregnancy). Two deaths occurred in our antenatal patients (previously discussed), twenty-six deaths occurred amongst the emergency cases.

Of the twenty-eight deaths eight were absolutely out of control. One being reported to the Coroner (criminal abortion), three patients were delivered and then sent

to the hospital in a very serious condition, four were admitted moribund and died within two hours of admission.

The deaths may be classified as follows:

(*a*) Primary medical conditions (six).—One from colitis, two from cardiac failure and three from pulmonary tuberculosis.

(*b*) Complications of pregnancy (twelve).—Six from abortion, one from hyperemesis (very ill on admission), three from eclampsia (all within a few hours of admission), two from severe chronic nephritis (one moribund with a cerebral hæmorrhage and one with blood urea of 271 milligrammes per hundred cubic centimetres).

(*c*) Complications of delivery (seven).—Three from Cæsarean sections done late in labour, two from ruptured uterus (both before admission), one from *placenta prævia* (previously discussed), one from shock in albuminuria following a manual removal of the placenta.

(*d*) Complications of puerperium (three).—One from perforated duodenal ulcer, two from lobar pneumonia (B.B.A.), one from nephritis and uræmia (B.B.A.).

In considering the deaths once more must be noted the small number, two, of our own antenatal patients contrasted with the large number, twenty-six, occurring in the emergency cases. Another interesting point is the high incidence of toxæmia or nephritis amongst the deaths (in eleven cases out of twenty-eight, all confirmed *post mortem*). We all regard chronic nephritis as the most serious disorder complicating pregnancy.

Medical Societies.

THE MEDICAL DEFENCE SOCIETY OF QUEENSLAND.

AT the Annual Meeting of the Medical Defence Society of Queensland held in December, 1926, the following report and financial statements were adopted.

Membership.

The Society has now a membership of 316, as compared with 277 in 1925. During the year forty-nine new members were elected, two were reinstated, ten left the State and two deaths occurred. The Council regrets to record the deaths of the following members: Dr. R. A. Macleod, Gympie, and Dr. H. F. Perkins, Mareeba.

Office Bearers Elected for 1926.

President: Dr. A. B. Carvosso.
Vice-President: Dr. J. Espie Dods.
Honorary Treasurer: Dr. A. H. Marks.
Honorary Secretary: Dr. E. S. Meyers.
Auditor: Mr. R. G. Groom.
Members of the Council: Dr. W. N. Robertson, Dr. W. F. Taylor, Dr. Wilton Love, Dr. Kerr Scott, Dr. A. G. Anderson, Dr. D. A. Cameron and Dr. A. Stewart.

Honorary Secretary.—Since May last this position has been held by Dr. Neville G. Sutton, Dr. Meyers having resigned the honorary secretaryship.

Medico-Legal.—Your Council has to report the following cases which were dealt with during the year:

A claim against a member for alleged unskilful operation which resulted in facial paralysis, mentioned in last year's report, was not proceeded with by the patient, the Society's solicitors having repudiated the liability on behalf of the member.

A member inquired whether the Society could take up a matter in connexion with a writ which had been issued against him by another member of the Society regarding a dispute over fees. The opinion of the Society's solicitors was obtained which was to the effect that the case was one in which the Society could not interfere. It was subsequently learnt that the matter had been satisfactorily settled.

A member who had issued a summons against a shipping company for a fee in connexion with a report issued by him on the condition of an employee who had been treated

MEDICAL DEFENCE SOCIETY OF QUEENSLAND.
Balance Sheet as at November 30, 1926.

LIABILITIES.	£ s. d.	£ s. d.
Accumulation Account—		
Balance at December 1, 1925 ..	1,894 0 5	
Add—Surplus of Income over Expenditure for Year ended November 30, 1926 (from Revenue Account)	268 8 4	
		2,162 8 9
		£2,162 8 9

ASSETS.	£ s. d.	£ s. d.
Queensland Medical Land Investment Co., Ltd.—		
200 shares of £1 each paid to 10s. per share		100 0 0
Commonwealth of Australia, Treasury Bonds—		
£200 4½% 1927	200 0 0	
£100 5 % 1927	100 0 0	
£200 6 % 1934	200 15 0	
£800 5½% 1941	800 0 0	
£1,300 at cost		1,300 15 0
Queensland Government Treasury Bonds—		
£100 6 % 1/3/1930	102 10 0	
£200 5½% 1/7/1936	200 0 0	
£200 5½% 1/7/1938	200 0 0	
£500 at cost		502 10 0
Cash at Banks on Current Account—		
National Bank of Australasia, Ltd.	120 0 6	
Commonwealth Savings Bank	138 19 8	
Cash in Hand	0 3 7	
		259 3 9
		£2,162 8 9

Examined with the Books, Vouchers and Securities and found correct.
ROY G. GROOM, F.A.C.P.A.,
Auditor.
Brisbane, December 7, 1926.

ALEX. H. MARKS,
Honorary Treasurer.

in a public hospital, had requested the opinion of the Council on the matter. The Council decided that the case was not one which came within the sphere of the Society and the opinion was expressed that the member had no right to charge a fee for the report, as merely a hospital certificate was asked for.

Another member inquired the legal position regarding putting in a *locum tenens* to finish his term of notice as medical officer of a hospital to enable him to take up a new appointment. He was informed that the matter was a question of arrangement between himself and the hospital committee.

A member who had been charged income tax on the sale of the goodwill of his practice, had referred the matter to the Society. Expert advice was obtained and the member was informed that he was liable for the tax under Section 10 of the *Income Tax Act* which was amended in 1922.

A member who had been called in to see a patient twelve hours after the birth of a premature child and found the child had been dead for some hours and had paid a further visit to the patient, desired to know whether he was entitled to the usual confinement fee. He was informed that he was entitled to claim fees for three professional visits, *videlicet* examination of infant's body and two visits to the patient; as he was not engaged for the confinement nor was he present thereat, he could not charge the usual fee.

A member whose position as medical officer of a hospital was terminated after having been given the requisite period of notice, desired to know whether the Society could take action. It was considered by the member that a definite stigma was attached to the mode of dismissal as no option of resigning was given nor had the Hospital Board at any time suggested neglect or inefficiency. It was claimed by the member that the evidence showed that the action of the Board was the result of personal enmity. It was decided by the Council that as the appointment had been terminated in conformity with the agreement between the member and the Hospital Board, no action could be taken. The member was also informed that if there is a case for defamation, it is outside the province of the Society to assist members in defamation cases.

In connexion with the appointment made to the position on the honorary staff of a public hospital a member had complained that the vacancy was not advertised in accordance with the rules of the Hospital Board. The matter was taken up with the Board in question and a reply received to the effect that the position was not advertised in accordance with the by-laws of the Board. The Board had thereupon been informed that the Council was of the opinion that as the appointment in question was not made in accordance with the by-laws of the Board, it should be declared null and void and fresh applications called in strict conformity with the Board's by-laws.

MEDICAL DEFENCE SOCIETY OF QUEENSLAND.

Honorary Treasurer's Statement for Year ended November 30, 1926.

RECEIPTS.	£ s. d.	£ s. d.
1925.		
December 1.		
To Cash at Banks and in Hand—		
Credit Balance, National Bank of Australasia, Ltd., Brisbane ..	67 12 5	
Credit Balance, Commonwealth Savings Bank, Brisbane	125 11 9	
Cash in Hand	1 2 9	
		194 6 11
1926.		
November 30.		
To Entrance Fees—		
49 New Members at £1 1s. each		51 9 0
„ Subscriptions		163 10 3
„ Exchanges		3 5 0
„ Dividends and Interest—		
Queensland Medical Land Investment Co., Ltd.—Dividend on 200 shares at 6%		6 0 0
Commonwealth Treasury Bonds—		
Interest on £200, 1927 4½%..	9 0 0	
Interest on £100, 1927 5 %..	5 0 0	
Interest on £200, 1934 6 %..	12 0 0	
Interest on £800, 1941 5½%..	37 3 9	
		63 3 9
National Bank of Australasia, Ltd.—		
Interest for six months on £100 Fixed Deposit, 5% ..		2 10 0
Queensland Government Treasury Bonds—		
5½%, 1938, Interest on £200	11 0 0	
5¼%, 1936, £200 applied for May, 1926	1 8 9	
6%, 1930, £100 purchased May, 1926; interest for six months	3 0 0	
		15 8 9
Commonwealth Savings Bank—		
Interest		7 7 11
„ National Bank of Australasia, Ltd.—		
Fixed Deposit		100 0 0
		£607 1 7

PAYMENTS.	£ s. d.	£ s. d.
1926.		
November 30.		
By Rent	5 0 0	
„ Exchange and Bank Charges ..	0 16 7	
„ Secretary's Salary	25 0 0	
„ Audit Fee	3 3 0	
„ Printing and Stationery	0 14 6	
„ Postage and Duty Stamps and Telegrams *et cetera*	2 19 2	
„ Federal Income Tax to November 30, 1925	1 17 0	
„ State Income Tax to November 30, 1925	3 15 7	
		43 5 10
„ Legal Expenses—		
Flower & Hart—*re* Dr. M. Lane and Drs. Shaw & Randall ..		2 2 0
„ Queensland Government Treasury Bonds—		
£200 5¼%, 1936 (Original Application)	200 0 0	
£100 6%, 1930, at £102 *plus* Brokerage 10s.	102 10 0	
		302 10 0
„ Cash at Banks and in Hand—		
Credit Balance—National Bank of Australasia, Ltd., Brisbane	120 0 6	
Credit Balance—Commonwealth Savings Bank, Brisbane	138 19 8	
Cash in Hand	0 3 7	
		259 3 9
		£607 1 7

A member forwarded correspondence received by him from the manufacturers of a certain headache powder which was to the effect that he had been making detrimental remarks regarding the powders in question. The Society's solicitors were interviewed, but as no further word was received from the manufacturers, it was decided not to take any further action.

Two members who had examined a patient, had received solicitors' letters demanding substantial compensation for alleged negligence in view of the fact that they had given the result as "++" whereas it was claimed that the patient had been examined by several other doctors in the south, the result of the later tests showing a complete "negative." The matter was handed over to the solicitors of the Society and as nothing further has been heard, the matter has apparently been dropped.

Assets.

The total assets of the Society now amount to £2,162 8s. 9d. During the year £300 was invested in Queensland Government debentures.

Research.

THE FOULERTON RESEARCH STUDENTSHIP.

THE following regulations have been issued by The Royal Society, Burlington House, London, W.1, in connexion with the Foulerton Research Studentship.

1. Subject to Candidates of sufficient merit presenting themselves one or more Studentships shall be created to be called "The Foulerton Research Studentships," the stipend of each Studentship, except as provided in paragraph 5 below, being £700 *per annum*, exclusive of the contribution, if any, made from the Fund towards provision for superannuation.

2. Appointments shall be made by the President and Council of the Royal Society on the recommendation of a specially appointed Committee of Fellows, to be called the "Foulerton Research Fund Managing Committee."

3. The duties of a Foulerton Research Student shall be to conduct researches in medicine or the contributory sciences under the supervision and control of the Committee, to whom the student will be required to report from time to time on the progress of his work.

4. The appointment to a Foulerton Research Studentship shall be for three years, and may be thereafter renewable from year to year on the recommendation of the Foulerton Research Fund Managing Committee, with a maximal total tenure of six years from the first award. In making a recommendation for an appointment, the Committee shall have in view the expressed wish of the donor that awards under the gift should be made especially to younger workers.

5. The Foulerton Research Studentships shall normally be regarded as whole-time appointments. In exceptional cases the Committee may recommend for a Studentship the holder of a paid teaching post, but if such a Candidate be appointed the Committee may recommend the payment of such stipend as they may think fit.

6. Members of either sex shall be equally eligible for the Studentship; but every Candidate must, if called upon to do so, show that he or she is and that his or her father and paternal grandfather are, or were at the date of their respective deaths, of British nationality.

7. Unless Council order to the contrary, provision shall be made for superannuation in the case of the holder of a Foulerton Studentship under the Federated Superannuation System for Universities, the premium being composed of a contribution from the Foulerton Fund equal to 10 *per centum* of the holders stipend and of a contribution by the holder of 5 *per centum* of his stipend.

8. If the Committee at any time find that a Foulerton Research Student neglects or is unable to fulfil the obligations of his appointment or is guilty of conduct or of continuing a course of conduct unbecoming in the holder of a Studentship, they shall report the facts so found by them to the President and Council, who shall have power to terminate his Studentship.

9. Words importing the masculine gender only in these rules include the feminine gender.

10. The President and Council reserve the power from time to time to make new rules for the administration of the Fund.

Candidates should state their age, qualifications for research and give references to two persons who can speak as to their previous work and experience in research. Applications (marked outside "Foulerton Studentship") must reach the Royal Society not later than March 1 next.

Correspondence.

MANIC-DEPRESSIVE INSANITY.

SIR: Dr. Lind is avenged at last. Yet after perusing his letter in your issue of December the fourth last, I am emboldened once more to kick against the pathologist's pricks.

Intellectual photophobia for the term "manic-depressive insanity" sends Dr. Lind back to mania and melancholia "as described by that grand old man Clouston." But why stop at Clouston? Four hundred years before Christ, Hippocrates, an even grander old man, had differentiated mania and melancholia. Aretæus, Celcus, Aurelianus and Galen also recognized these antithetic states. Wherefore, then, such kudos to Clouston? To say that he was "a better student and exponent of psychiatry than the Continent ever produced" is to put him on a pedestal of praise supported more by personal bias than scientific fact. In thus disparaging by implication the Continental psychiatrists, presumably because Kraepelin coined the term "manic-depressive insanity," Dr. Lind seems to forget that the original idea belongs to Thomas Willis, an English physician of the seventeenth century.

Whether or not with profit, I submit that I have read Dr. Lind's paper "carefully," and carefully also have I read his brochure "An Aid to the Study of Insanity," where, on page 6, under the heading of mania, I found the enlightening remark that: "There is practically always a preliminary stage of depression in this . . . ." I rubbed my eyes. I read again. Mania connected with depression! Depression entering the paradigm of mania! *Mirabile visu.* Then, why not "manic-depressive insanity"?

Yours, etc.,

REG. S. ELLERY.

Sunbury, Victoria,
January 12, 1927.

Proceedings of the Australian Medical Boards.

NEW SOUTH WALES.

THE undermentioned have been registered under the provisions of *The Medical Act*, 1912 and 1915, as duly qualified medical practitioners:

MacKay, Irwin Hugh, L.M.S.S.A. (London), 1925, c.o. Mrs. D. Glover, William Street, Hornsby.

For Additional Registration.

Barriskill, John Robert, Ch.M., 1926 (Univ. Sydney).
Foley, Horace John, Ch.M., 1926 (Univ. Sydney).
Harris, George Thomas Hamlyn, Ch.M., 1926 (Univ. Sydney).
Vote, James Alexander, Ch.M., 1926 (Univ. Sydney).
Maguire, Frederick Arthur, M.D., 1926 (Univ. Sydney).
Nelson, William Thomas, M.D., 1926 (Univ. Sydney).
Raymond, Roland Lionel, F.R.C.S. (Edinburgh), 1926.

TASMANIA.

THE undermentioned have been registered, under the provisions of the *Medical Act* of 1918, as duly qualified medical practitioners:

Caldwell, Wallace Edwin, M.B., B.S., 1926 (Univ. Melbourne), Victoria.

Hallowes, Herbert Francies Chaworth, M.B., B.S., 1926 (Univ. Melbourne), Launceston.
Mitchell, Hugh Grenville, M.B., Ch.M., (1926 (Univ. Sydney), Queenstown.

Obituary.

ROBERT BRUMMITT.

WE regret to announce the death of Dr. Robert Brummitt which occurred at Menindie, South Australia, on January 11, 1927.

REGINALD FRANCIS BOWER.

WE announce with regret the death of Dr. Reginald Francis Bower which occurred at Stanthorpe, Queensland, on January 12, 1927. Just prior to his death Reginald Francis Bower was Superintendent of the Beerburrum Hospital. He was a graduate of the University of Sydney, having obtained the degree of bachelor of medicine in 1921. He was well known throughout the north coast of Queensland where he was deservedly popular both as a medical practitioner and on account of his devotion to sport and to anything pertaining to the good of the district. For two years he had been in bad health and it was hoped that a change to Stanthorpe would be of benefit to him. These hopes were not realized and he died at the early age of thirty-three, leaving a widow and two small children, to whom the sympathy of the medical profession is extended.

Medical Appointments.

Dr. Whitfield De Witt Henty (B.M.A.) has been appointed Acting Medical Superintendent of the Hospital for the Insane and the Receiving House, Royal Park, Victoria.

* * * *

Dr. Peter Lalor has been appointed Acting Medical Superintendent of the Hospital for the Insane at Sunbury, Victoria.

* * * *

Dr. Sydney Bernard Hudson (B.M.A.) has been appointed Public Vaccinator at Sorrento, Victoria.

Books Received.

HEALTH: A TEXTBOOK FOR SCHOOLS, by M. Avery, B.Sc. (London), M.R.San.I.; 1926. London: Methuen and Company, Limited. Post 8vo., pp. 233, with illustrations.
OUTWITTING MIDDLE AGE, by Carl Ramus, M.D.; 1926. London: George Allen and Unwin, Limited. Crown 8vo., pp. 280. Price: 7s. 6d. net.

Medical Appointments Vacant, etc.

FOR announcements of medical appointments vacant, assistants, *locum tenentes* sought, etc., see "Advertiser," page xxii.

ALFRED HOSPITAL, MELBOURNE: Honorary Obstetrician.
AUSTIN HOSPITAL, HEIDELBERG, VICTORIA: (1) Honorary Gynæcologist. (2) Honorary Pathologist.
DEPARTMENT OF PUBLIC HEALTH, TASMANIA: Assistant Health Officer.
DEPARTMENT OF PUBLIC INSTRUCTION, QUEENSLAND: Medical Officer.
REPATRIATION COMMISSION: Junior Resident Medical Officer.
ROYAL NORTH SHORE HOSPITAL OF SYDNEY: Resident Medical Officer.
SYDNEY HOSPITAL: Part-time Bacteriologist.

Medical Appointments: Important Notice.

MEDICAL practitioners are requested not to apply for any appointment referred to in the following table, without having first communicated with the Honorary Secretary of the Branch named in the first column, or with the Medical Secretary of the British Medical Association, Tavistock Square, London, W.C.1.

BRANCH.	APPOINTMENTS.
NEW SOUTH WALES: Honorary Secretary, 30 - 34, Elizabeth Street, Sydney.	Australian Natives' Association. Ashfield and District Friendly Societies' Dispensary. Balmain United Friendly Societies' Dispensary. Friendly Society Lodges at Casino. Leichhardt and Petersham Dispensary. Manchester United Oddfellows' Medical Institute, Elizabeth Street, Sydney. Marrickville United Friendly Societies' Dispensary. North Sydney United Friendly Societies. People's Prudential Benefit Society. Phœnix Mutual Provident Society.
VICTORIAN: Honorary Secretary, Medical Society Hall, East Melbourne.	All Institutes or Medical Dispensaries. Australian Prudential Association Proprietary, Limited. Mutual National Provident Club. National Provident Association.
QUEENSLAND: Honorary Secretary, B.M.A. Building, Adelaide Street, Brisbane.	Members accepting appointments as medical officers of country hospitals in Queensland are advised to submit a copy of their agreement to the Council before signing. Brisbane United Friendly Society Institute. Stannary Hills Hospital.
SOUTH AUSTRALIAN: Secretary, 207, North Terrace, Adelaide.	Contract Practice Appointments at Ceduna, Murat Bay and other West Coast of South Australia Districts.
WESTERN AUSTRALIAN: Honorary Secretary, 65, Saint George's Terrace, Perth.	All Contract Practice Appointments in Western Australia. Yarloop Hospital Fund.
NEW ZEALAND (WELLINGTON DIVISION): Honorary Secretary, Wellington.	Friendly Society Lodges, Wellington, New Zealand.

Diary for the Month.

FEB. 8.—Tasmanian Branch, B.M.A.: Branch.
FEB. 8.—New South Wales Branch, B.M.A.: Ethics Committee.
FEB. 10.—Victorian Branch, B.M.A.: Council.
FEB. 11.—Queensland Branch, B.M.A.: Council.
FEB. 15.—Tasmanian Branch, B.M.A.: Council.
FEB. 15.—New South Wales Branch, B.M.A.: Executive and Finance Committee.
FEB. 16.—Western Australian Branch, B.M.A.: Branch.
FEB. 23.—Victorian Branch, B.M.A.: Council.
FEB. 24.—South Australian Branch, B.M.A.: Branch.
FEB. 25.—Queensland Branch, B.M.A.: Council.
MAR. 1.—Tasmanian Branch, B.M.A.: Council.
MAR. 2.—Victorian Branch, B.M.A.: Branch.
MAR. 2.—Western Australian Branch, B.M.A.: Council.

Editorial Notices.

MANUSCRIPTS forwarded to the office of this journal cannot under any circumstances be returned. Original articles forwarded for publication are understood to be offered to THE MEDICAL JOURNAL OF AUSTRALIA alone, unless the contrary be stated.

All communications should be addressed to "The Editor," THE MEDICAL JOURNAL OF AUSTRALIA, The Printing House, Seamer Street, Glebe, Sydney. (Telephones: MW 2651-2.)

SUBSCRIPTION RATES.—Medical students and others not receiving THE MEDICAL JOURNAL OF AUSTRALIA in virtue of membership of the Branches of the British Medical Association in the Commonwealth can become subscribers to the journal by applying to the Manager or through the usual agents and booksellers. Subscriptions can commence at the beginning of any quarter and are renewable on December 31. The rates are £2 for Australia and £2 5s. abroad *per annum* payable in advance.

Wholly Set Up, Published and Printed at The Printing House, Seamer Street, Glebe, Sydney, N.S.W., by HENRY WILLIAM ARMIT, of The Point Road, Woolwich, Sydney, on behalf of THE AUSTRALASIAN MEDICAL PUBLISHING COMPANY, LIMITED, of 30-34, Elizabeth Street, Sydney.